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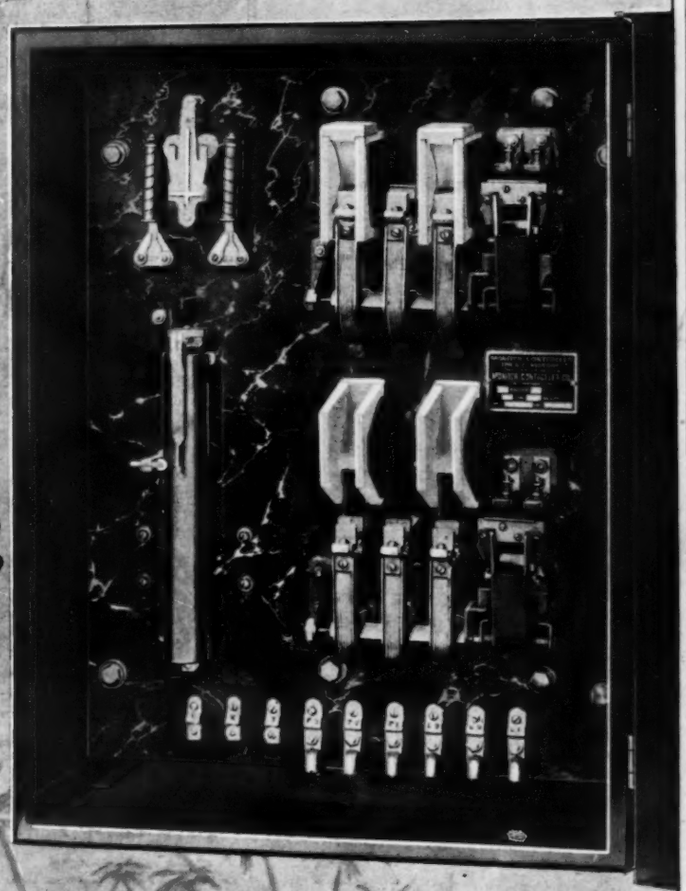

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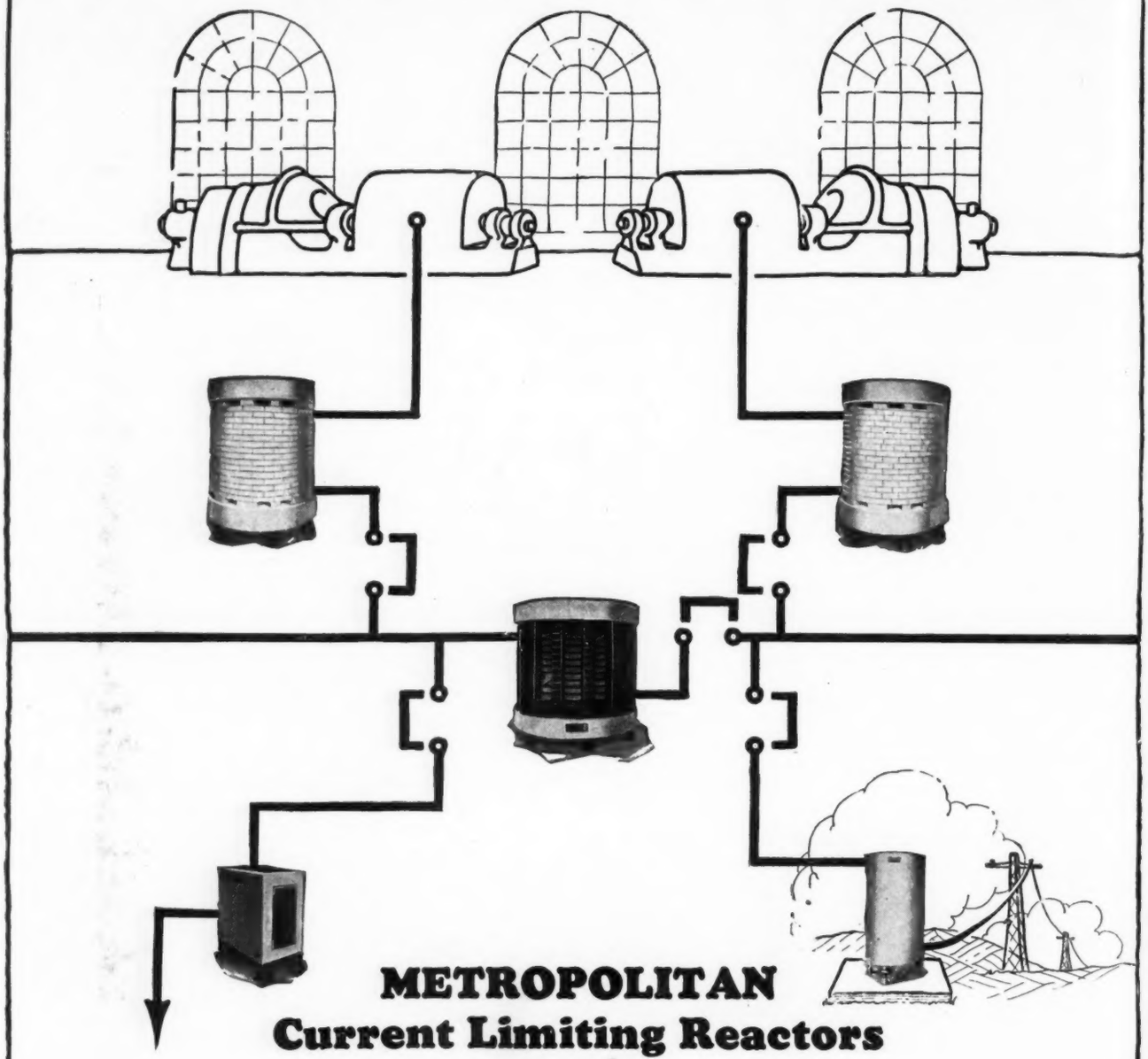

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McGRAW-HILL
PUBLISHING COMPANY, INC.
Tenth Avenue at 36th Street,
NEW YORK, N. Y.
Cable Address "Machinist, N. Y."

JAMES H. McGRAW, President
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NEW YORK Dist. Office, 285 Madison Av.
WASHINGTON, National Press Building
CHICAGO, 7 South Dearborn St.
PHILADELPHIA, 1600 Arch St.
CLEVELAND, Guardian Building
ST. LOUIS, Bell Telephone Building
SAN FRANCISCO, 883 Mission Street
LONDON, 6 Bouverie St., London, E.C.4

Publishers of

Electrical World
American Machinist
Electrical Merchandising
Engineering and Mining Journal
Chemical and Metallurgical Engineering
Bus Transportation
Power
Coal Age
Radio Retailing
Engineering News-Record
Electric Railway Journal
Ingeniería Internacional
Construction Methods
Electrical West
(*Published in San Francisco*)
American Machinist—European Edition
(*Published in London*)

SUBSCRIPTION PRICES: United States and its possessions, Canada, Mexico, and other countries taking domestic postage rates, $5 a year. All other foreign countries, $9 a year. Single copy, 25 cents. Published weekly. Entered as second class matter, Jan. 20, 1907, at the Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U. S. A.

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CHANGE OF ADDRESS

Subscribers are requested to send both the old address and the new address when they move to a new address.

Member Audit Bureau of Circulations.
Member Associated Business Papers.

Circulation of this issue, 18,285

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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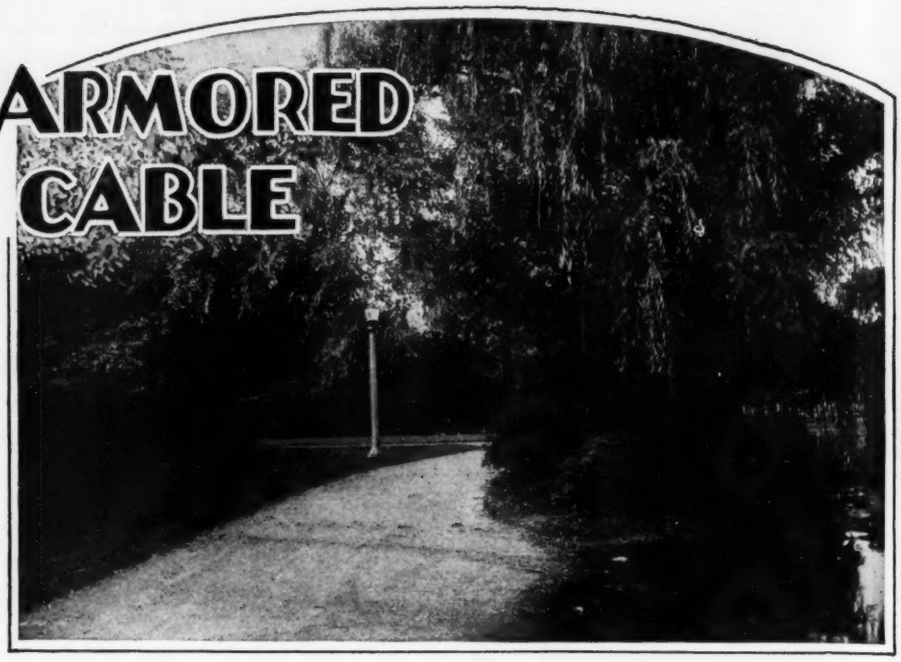

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Electrical World

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VOLUME 92 — *New York, Saturday, September 15, 1928* — NUMBER 11

Utility Aid to Industry

PROGRESSIVE utility companies encourage the development of the territories they occupy. They try to serve all customers in existence along their lines and go further than this in order to bring new customers into the territory. Most of the new industries coming into a region can be counted on to buy power, and all of them produce a regional growth that brings new business directly and indirectly to the utility.

The Midland Utilities Company, through its operating subsidiaries, has created a fund of $200,000 to aid industrial customers in the territory served. Money will be loaned to worthy industries, and the utility fund will be used in conjunction with other funds in local cities produced by chambers of commerce or other civic groups. A national sales staff is operated to build up existing industries and to bring new industries to the territory served by the Southeastern Power & Light Company, and these staffs are backed with thorough reports on the resources of the territory and on several alternative ways to get financial aid for new industrial plants. Several other companies have taken similar steps to aid industries already served and to develop new industries.

Such utilities are looking ahead. Their managements realize that new loads must be coaxed and that they can co-operate effectively with customers in the normal conduct of their business. It is a step ahead to set up an industrial loan fund, and this new policy must have been considered very carefully by Samuel Insull and his associates. The move is part of a new era in electric service and gives tangible evidence that stagnation does not exist in utility management.

* * * *

Serving the Soil

MANY of the failures to establish profitable rural lines can be traced to a lack of appreciation on the part of the commercial men of the utility company of the mental attitude and reactions of those to whom they endeavor to sell. The farmer by nature and tradition is conservative. He is proud of his independence and is willfully reactionary. It is a heritage of the land. He must be shown, not lectured or "sold" or involved in theories. He must know through demonstration and local experience that electricity will do his work for him, economically, satisfactorily and better than he now does it by other means. If he knows that a neighbor accomplishes with the aid of electricity the same chores that are tediously annoying without its aid, if he can see the difference that a relatively small expenditure will produce in a home and farm similar to his own, if he can step up and operate a motor-driven device and find it sturdy enough to do with facility the job that took a large portion of his manual effort, he is well on the way to conversion. But he is not necessarily ready to accept the idea of electric service at that time. The rural housewife who looks upon electric cooking as a wholly new method of preparing food and views with suspicion the possibilities of "that little coil of wire" is endowed with the same characteristic skepticism as is her husband, and both must be treated with understanding and patience.

The time to do the missionary work is before the farmer's service is installed. The line should be profitable from the very beginning. It should be made so through the connection of every farm on its route to the utility supply and by the intensive utilization of service by the individual consumer. This is not a theoretical ideal. It has been done on many properties and can be done on many more. The psychology of the farmer must be appreciated. A new type of salesman may be required. He should be a man of the soil, not too young, not too enthusiastic, and willing to wait and work patiently for the idea of electric service to be accepted without arousing stubborn determination on the part of the farmer not to be convinced.

* * * *

Passing Prosperity Around

FOR several years the Hartford Electric Light Company has shared surplus earnings with its customers through substantial reductions in their October bills. Now comes an extension of this policy to include employees and stockholders in a total distribution of almost half a million dollars voted upon next month's bills, wages and regular dividends. Earnings this year have been the best in the company's history, and the directors have also decided to establish on December 1 rates which are intended to bring the over-all price of electricity for full domestic service for normal lighting, cooking, refrigeration, water heating, and so on, to about two and three-quarters cents per kilowatt-hour.

The "customer-dividend" policy of this company has provoked a good deal of informal discussion within the industry, but under the Hartford conditions it appears to have been highly satisfactory. It is cause for congratulation that a tripartite distribution can now be made to enable all concerned to share in the current prosperity. Thus is disposed of an objection sometimes urged against the policy in the past—that the customer should not be the sole beneficiary of such a disbursement. Again, the contention that increasing surplus should be devoted to rate reductions instead of to an annual heavy discount on one month's bills loses some of its force when both steps are taken virtually together. As for the objection that since accumulated surplus belongs to the stockholders it is unnecessary and dangerous to share it with customers, virtually every voluntary reduction in rates raises this point.

The causes behind the Hartford company's prosperity

are many. Conspicuous among these are increased organization efficiency, greater use of electricity by customers, several years' application of promotional rates, lower-cost coal and an abnormal supply of hydro-electric energy made available through skillfully handled interconnections. The territory is attractive and this is an economic asset of great value.

The trend of the art is toward lower prices for the major portion of energy units consumed. This means a narrowing of the gaps between prices for service in different places of comparable status. How best to reach suitable prices is a long series of problems governed in large measure by local conditions. It takes time to adjust rates and to measure the permanency of prosperity. Whether utility executives favor establishing lasting rate changes rather than to make periodical cuts in bills is less important than their general attitude toward the disposition of revenues and savings where these run above normal for a period of time. The willingness of the Hartford company to share its experience with others in the industry has been useful, regardless of whether others contributing to the progress of the art have agreed with Mr. Dunham in his day or Mr. Ferguson in his as to the merits of their respective policies and experiments. Foresight has ever been a characteristic of this management.

* * * *

Spirit of Technical Advance Characterizes Spokane Meeting

A WELL-ARRANGED and well-balanced program was provided for those who attended the recent Pacific Coast convention of the American Institute of Electrical Engineers at Spokane. The nineteen papers presented covered research, academic studies, railway and industrial electrification and practical operating problems. Of the seven technical sessions, two were devoted to papers by members of student branches, but all who attended the convention were privileged to sit in and enter into the discussion.

Several papers at the general technical sessions stood out prominently. From tests on sphere gaps and needle-point gaps up to 2,100,000 volts at the Ryan laboratory it has been found that the rapid decrease in kilovolts per inch necessary to break down gaps in excess of nine feet to ground establishes an approximate limit of high-voltage transmission based on present-design practice. A paper giving results of a comprehensive series of field tests to determine the effect of short circuits on the movement of overhead conductors indicates that spacings, span length and tensions at present considered good practice on heavy feeders in the vicinity of substations are not adequate to prevent conductors from swinging together after repulsion due to short circuits. Results of the tests clearly indicate that the effects of short circuits are a factor to which more consideration must be given in future line design.

The method and apparatus employed in successfully applying carrier-current telephone communication to a 220-kv. circuit operating in corona were described in another paper, producing much discussion. The authors of the paper pointed out that the application of the single side-band, carrier-suppressed system had been found to be an effective means of overcoming the line modulation effect due to corona around the transmission conductors.

Papers dealing with transmission calculations, automatic substations, lightning, railway electrification and operating problems were others of considerable interest and value to the 250 delegates who attended the convention. At every meeting of electrical engineers accounts of new devices, of improvements in old apparatus and methods and of the advance in the art itself show the keen spirit that animates and spurs the profession.

* * * *

Human Aspects of Management

THE local manager of a utility company is the company in the opinion of his fellow-townsmen. He can make or mar public relations as well as make or mar the balance sheet. In fact, he is more likely to influence the public's attitude than he is to do much either way with the balance sheet of a subsidiary of a large holding organization. Success in local management depends upon personality above all other qualifications.

In the consolidation of local utility properties into large holding groups there may be a tendency to minimize the importance of the position of a local manager. It is false economy and poor management to replace personality by efficiency without personality. To the merchants, the politicians, the churchgoers and to Tom, Dick and Grace the local manager can be friend and neighbor or an efficient but cold-blooded representative of absentee utility owners. Large utility holding groups might well have a vice-president to look after this aspect of the management of subsidiaries. In the final analysis it is the human touches that make for success in local service.

* * * *

Tuning Up for Net

A GLANCE at utility earning statements shows a very satisfactory increase in net earnings. In several instances a slight increase in gross earnings is accompanied by a large increase in the net, and in most statements the incremental gains in net earnings are greater than those of the gross revenues. This condition is an excellent indication of financial stability and of efficiency in management.

Several factors have brought about the net increases. During the past few years large investments have been made to rehabilitate properties and to replace inefficient with efficient apparatus. The engineers have introduced large savings by increasing the thermal economy of fuel-burning stations and have used a combination of fuel and hydro stations to reduce costs of generation below those possible with the use of fuel or water alone. More intelligent layouts of systems have been made, and interconnection has had an important influence in reducing the total system power costs.

But advances in the art and in system engineering have been accompanied by management developments equally potent to reduce costs. The operating slack has been removed from many properties and, during the past year especially, utility executives have stressed economy in expenditure. Large increases in investment values made possible operating savings of many kinds because the man power of the industry has been reorganized to function more economically. One tangible effect of utility consolidations has been to reduce the number of high-grade and high-salaried executives required on local properties. Fortunately these eliminations caused little disturbance to employment because the growth of the

industry was sufficient to utilize the excess talent in other positions.

As is the case with all rapidly growing industries, there arrives a time when an organization which has shot up as haphazardly as Topsy must give way to a functionalized division of labor that will be effective and efficient. A slight decrease in rate of growth and a largely increased investment have brought the occasion and the pressure for this reorganization in the electrical industry.

The end is not yet in sight. One great source of money loss is the iron and heat losses that occur between the generator and the load. An average energy loss of about 17 per cent can be reduced to 10 per cent at least as a profitable part of utility operations. The distribution system with its equipment is the source of greatest loss, and the time is ripe for rehabilitation and good housekeeping in distribution. Losses can be reduced only bit by bit. The job involves a multitude of small studies, but the results pay dividends. Other possibilities for system operating economies also exist, and the saving trend under way will surely show equally good results on net earnings in the years to come. Saving now has equal place with spending in the minds of both the executive and the engineer.

* * * *

The Everlasting Why

IN AN endeavor to express the abounding lack of information and the improbability of ever securing any adequate amount of knowledge even on apparently uninvolved physical matters one can go no farther than did Sir Oliver Lodge many years ago when he asked, "When I lift one end of my walking stick, why does the other end come up?" As pointed out recently by Prof. Herbert F. Moore, no one has ever satisfactorily answered the question. The glib reply of the physicist of a generation ago would have referred to the cohesion between the particles. Today the physicist would hesitate to concede the existence of a cohesive force. He wanders vaguely in complicated expressions, conjures up electrons or the quantum and leaves us gasping and unenlightened.

It is characteristic of the materialistic age to assume that, presently, when all the data have been collected, the evidence weighed and the reckoning completed, we shall know this and that which today is just beyond our reach. We shall, by dint of much research, endless tearing to bits and putting together again, by unceasing attention to details revealed to us or concealed from us by our five lying senses, determine presently just what the world is all about, where we are bound (if at all), what electricity really is, what—other than fancy—lies beyond the blue, the secret of life, or even, if we are fortunate, why the two ends of a walking stick follow the assumed laws of translation and rotation.

* * * *

Cataloging Troubles— An Aid to Progress

"PROGRESS depends on the extent to which you analyze what is wrong with your product and then proceed to correct." This statement was made last week by Charles F. Kettering of the General Motors Company, and it can be applied to the utility industry by changing the word "product" to "service." If a large industry having the national importance of the General Motors Company has found it productive of more and better business to catalog, as a basis for developing improvements, all the troubles reported, the same procedure should be beneficial elsewhere, in principle at least.

When correction of troubles in material products is involved, the research, engineering and production departments can individually or jointly solve the problem. But rendering electric service involves more than a material product. The customer must apply for service; perhaps construction work may be done on his property or on property which he uses. His meter must be read and his bill paid monthly. Possibly he suffers an interruption of service due to faults in his own equipment, storms or some other contingency, or he may have reason to complain about a bill or the quality of service. Occasionally service must be obtained on other premises.

The utility functions in handling these contacts with the customer involve, of course, physical operations and physical materials. But the human element, particularly if some transaction goes askew, is more evident to the customer than the physical elements. Hence, if utilities literally apply the General Motors scheme of cataloging all troubles reported as a basis for correcting conditions, they will find it equally important to analyze wherein and to what extent the human element may be an important factor in the service rendered.

Every department and every individual in these departments will be found to have some influence directly or indirectly on the customer's impression of the company. Not only must the individuals realize this, but the company has a duty to perform in making it easy to serve the customer promptly and agreeably.

* * * *

A Steady Old World

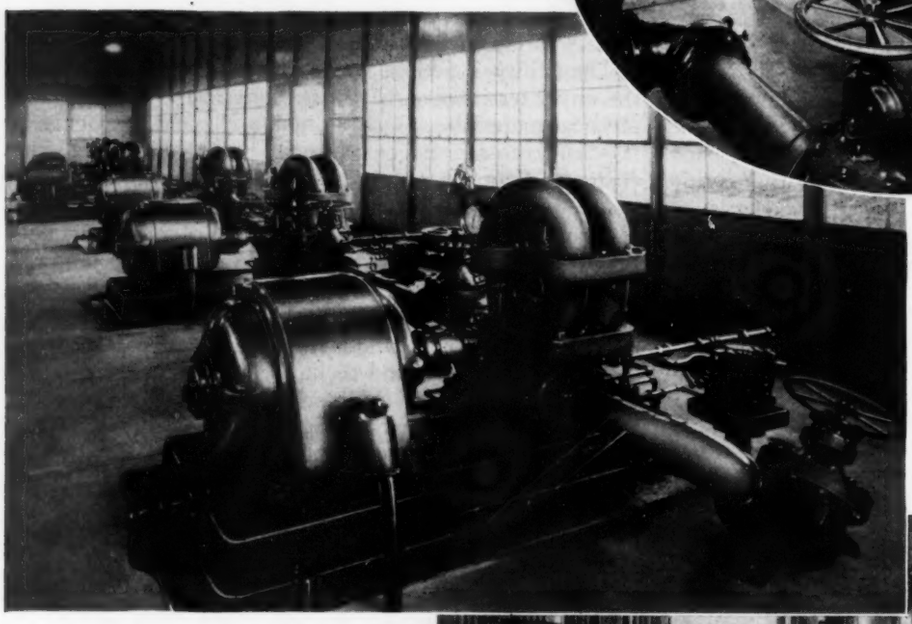
THE atomic energy of the world will never be tapped, according to Dr. R. A. Millikan, who expressed this opinion in an address before the Society of Chemical Industry last week. If Einstein's equation and Ashton's curve are even roughly correct, the supposition of an evolution of energy through the disintegration of the common elements is a dream and a bugaboo, for the great majority of the elements are in a state of maximum stability—they have no energy to give up.

Dr. Millikan says that the source of world energy is the cosmic rays. "They are the signals broadcast through the heavens of the birth of the elements out of positive and negative electrons. There is no doubt they represent the birth cries of the infant atoms of helium, oxygen and silicon. We have indication, too, that we can hear the shriller birth squeaks of infant iron." Out in space electrons are being continuously formed and are being continually replenished by stellar radiation, so that the universe is in equilibrium. The death ultimately of the universe from heat is a demolished doctrine, and in the billion years ahead of man his own acts are apt to have a greater influence upon subsequent human conduct than any invention that harnesses energy.

It is well to have one who is both a philosopher and a scientist to interpret the physical world. Dr. Millikan has the happy gift of making new discoveries in science clear, and yet he never fails to orient them in terms of human effects. We must look to the harnessing of cosmic rays as a new energy source when our embalmed energy in fuel and oil has been used. Half the battle is won when knowledge of the energy source exists.

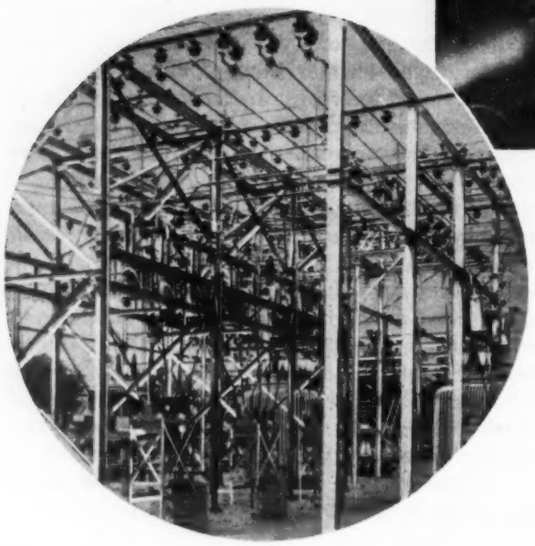
Oil Field Processes Are Electrified

Natural gas plants and oil refineries are characterized by great numbers of scattered small units admirably adapted to electric drive. These pumps circulate cooling water and mineral seal oil



High-speed motors and pumps have effected marked changes in the size and appearance of pipe-line plants. This station has a capacity of 47,000 bbl. per day

Batteries of electric motor-driven air compressors force air or gas down into the wells from which the oil is ejected. This method has become very popular in a brief period



Outdoor substations are located at strategic points throughout the oil field where the transmission voltage is stepped down to a moderate value for distribution to the leases and large power consumers. Transformer banks, close to the motors, again step the voltage down to 440 for power purposes

Photos courtesy General Electric Company

Precipitation *in Europe*

Rapidly being adopted by industrial plants. Description of installations. Economics of application to gas purification. Construction details

By G. Berg
Brussels, Belgium

SINCE the war "electrofilters" have been developed, mainly in the United States by the Western Precipitation and allied companies (Cottrell patents) and in Germany by the Siemens-Schuckert Company (Siemens patent). It is estimated that there are at present about two thousand electrical precipitation plants in the world, of which eight hundred are situated in the United States and one thousand in Germany.

Considerable difficulties were experienced in the adaptation of electric precipitation to the different branches of industry, as it was found that laboratory electrofilters behaved very differently from full-size industrial plants. This was due to the fact that the electric field necessary for the precipitation of particles in suspense is influenced by: (1) the temperature of the gas; (2) the physical and chemical properties of the gas; (3) the physical and chemical properties of the particles to be precipitated; (4) the pressure of the gas; (5) the speed of the gas.

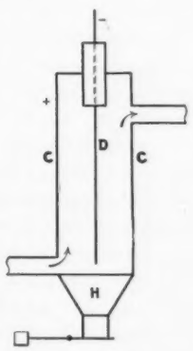


Fig. 1—Diagram of pipe-type electrofilter

C—Collecting electrodes. D—Discharge electrode. H—Hopper for precipitate.

It must also be remembered that many of these factors vary between wide limits in industrial works and that their variations cannot be reproduced in a laboratory. Thus each new application of electric precipitation had to be investigated on a large scale in an experimental plant at the works.

Much time and money was spent by the Siemens company and by the Cottrell and Lugi companies in determining the most favorable conditions for these new industrial applications. However, as experience has shown, once electric precipitation has obtained a foothold in a branch of industry, it gradually dislodges all other methods of precipitation.

The process consists fundamentally in passing the dust-laden gas between two oppositely charged electrodes, one of small area, usually a wire, known as the "discharge electrode," and the other of large area, usually a cylinder or plate, known as the "collecting electrode" (*C*). Under favorable conditions the dust will be precipitated from the gas upon the surface of the collecting electrode.

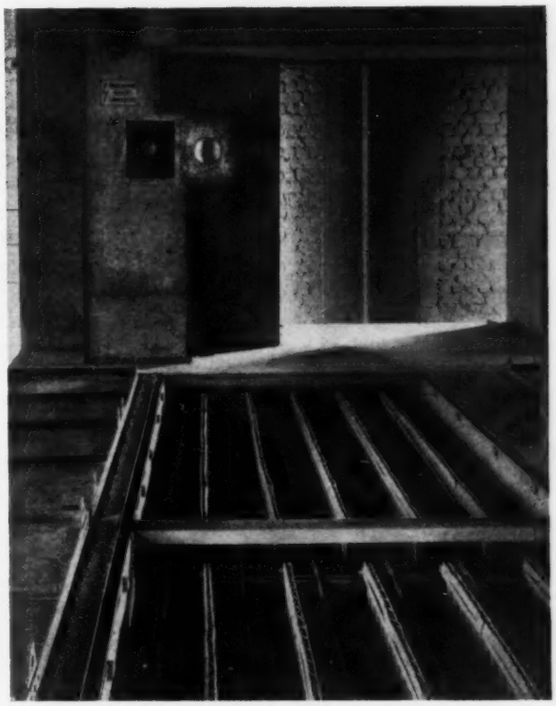


Fig. 2—Interior view of box-type electrofilter used in cement plant

The *modus operandi* is roughly as follows: An electrostatic field is induced between the two electrodes by subjecting them to a potential difference of the order of 100,000 volts. If the discharge electrode be made of thin wire, the potential gradient at its surface will be of the order of 30,000 volts per centimeter, thus causing corona discharge. As the negative pole is connected to the discharge electrodes, electrons are emitted from these and impinge on the gas molecules, imparting to them their negative charge. The gas ions so formed are repelled by the discharge electrodes and travel rapidly toward the collecting electrodes of opposite sign. Any dust particles present in the intervening space are attracted by these ions, negatively charged and driven by electric force toward the collecting electrode. The suspended particles are also driven mechanically by the rush of ions from the discharge electrodes to the collecting electrode. Once the particles are precipitated, they give up their charge and, being no longer influenced by the electric field, fall down along the electrode into a hopper.

Types of Electofilters

Two types of precipitation apparatus are in general use:

1. The pipe-type form generally adopted in the Cottrell system, in which an axial wire forms a discharge electrode in a metal pipe forming the collecting electrode.

2. The box type used mainly for the Siemens patents, in which a wire (or expanded metal) discharge electrode is suspended between two flat sheet-metal collecting electrodes, the whole being inclosed in a rectangular chamber.

To treat large quantities of gas in the pipe-type electrofilter a large number of pipes, hundreds in some cases, are connected in parallel. In the box type the collecting and discharge electrodes are alternatively spaced, as in the case of a lead accumulator.

This is seen in Fig. 2, which shows the interior of a box type of electrofilter in a cement plant. The filter

consists of two chambers; the one on the left is covered by a plate which fits in sand-filled grooves, but the one on the right has the cover removed in the photograph. The covers are removed for inspection or for lowering electrodes into position. Precipitation occurs on the five rows of corrugated-iron electrodes and on the walls of the chambers. The discharge electrodes are made of wires stretched on iron frames and are insulated.

The collecting electrodes are made of corrugated iron

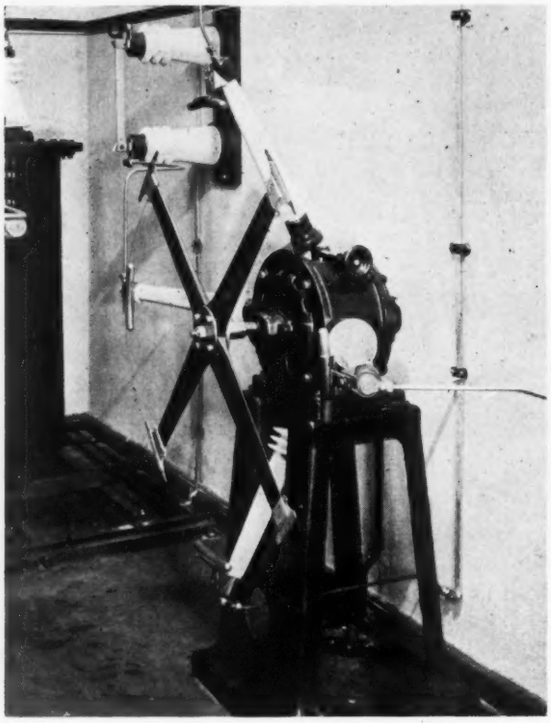


Fig. 3—Mechanical rectifier for 80,000 volts

for the sake of rigidity and are earthed as well as the casing of the chamber. The latter may therefore be touched without any danger. The distance between the electrodes of different polarity differs with the nature of the gases treated, but is usually about 6 in. The speed of the gas varies, according to the different applications, from $\frac{1}{2}$ ft. to 12 ft. per second. At this speed it passes along the electrodes, which vary from 9 ft. to 36 ft. in length according to the type of electrofilter. The particles contained in the gas are under the influence of the electric field during only two to twenty seconds. In cases where there is a danger of reaching the dew point of the treated gas, or when the precipitated particles are conducting, the insulators are placed outside the chamber in special small sheds, so as to prevent their being coated with a conducting layer which would sooner or later cause flashover. The resistance to the motion of the gas in these electrofilters is very small, usually less than $\frac{1}{8}$-in. water.

Owing to secondary electric reactions and to the naturally adhesive nature of the precipitated particles, some dust adheres to the discharge electrodes, thus greatly reducing their effectiveness. To prevent this the discharge electrodes are rapped periodically by a special mechanism actuated by hand or automatically by a small electric motor. A similar mechanism also raps the collecting electrodes in those cases where the precipitated dust does not fall down of its own accord. When the precipitated particles have little adhesive power, as in the case of coal-dust, or are in the liquid state, the rapping is unnecessary.

The vertical and horizontal arms seen on the casing of the electrofilter shown in Fig. 5 form part of this rapping mechanism.

Modern Electrofilter Plants

The diagram of connections of an electric precipitation installation is very simple, as may be gathered from Fig. 4. The high-tension winding of a single-phase step-up transformer (*b*) is connected to two opposite terminals of the mechanical rectifier (*d*), driven by a synchronous motor (*c*).

One of the two remaining terminals of the rectifier is grounded and the other is connected to the high-tension line leading to the discharge electrodes of the electrofilter (*f*). As stated before, the collecting electrodes (*e*) are earthed so that the return path of the current is through the earth. The high-tension current thus flows from the transformer through the rectifier to the electrofilter.

The rectifier, as built by the Siemens-Schuckert company (see Fig. 3), consists of a wooden cross, each end of which is fitted with a metallic contact shoe. A wire connects these electrically in pairs, as indicated in Fig. 4. The high-tension current passes with a slight hissing noise through an air gap of about $\frac{1}{8}$ in. between the rotating contact shoes and the terminals of the rectifier. The length of the contact shoes and of the terminals is chosen so that the current can pass from one terminal to the opposite contact shoe only during a little less than half a period. It can be seen from Fig. 4 that when the next shoe passes in front of the terminal the connections to the exterior circuit will be reversed. The current in the electrofilter will thus be a unidirectional (continuous) pulsating current. Kenotrons have also been used as rectifiers. They produce a much smoother current wave, but are little employed in Europe, as they are expensive, delicate to handle and have a short life.

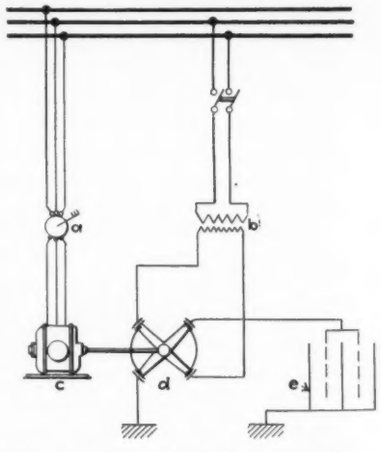


Fig. 4—Electrical elements of an electrical precipitation plant

It may be mentioned that under specially unfavorable conditions mechanical rectifiers may produce high-frequency disturbances, making the reception of wireless messages almost impossible within a a radius of 10 miles. The oscillating circuit consists of the transformer, of the electrofilter acting as a condenser, and of the rectifier acting as an air gap between the two. Such disturbances can be almost entirely eliminated by the introduction of suitably proportioned resistances or condensers in the circuit.

Industrial Applications

One of the most remunerative uses of electrofilters in industry is the application to the recovery of metallic dust from smelter fumes. Fig. 5 shows an electrofilter built by the Siemens company for large smelting works in Germany. This plant treats about 20,000 cu.ft. of gas per minute. The gases issuing from copper converters are first cooled in tubular cooling towers (shown in the background) down to the most favorable tempera-

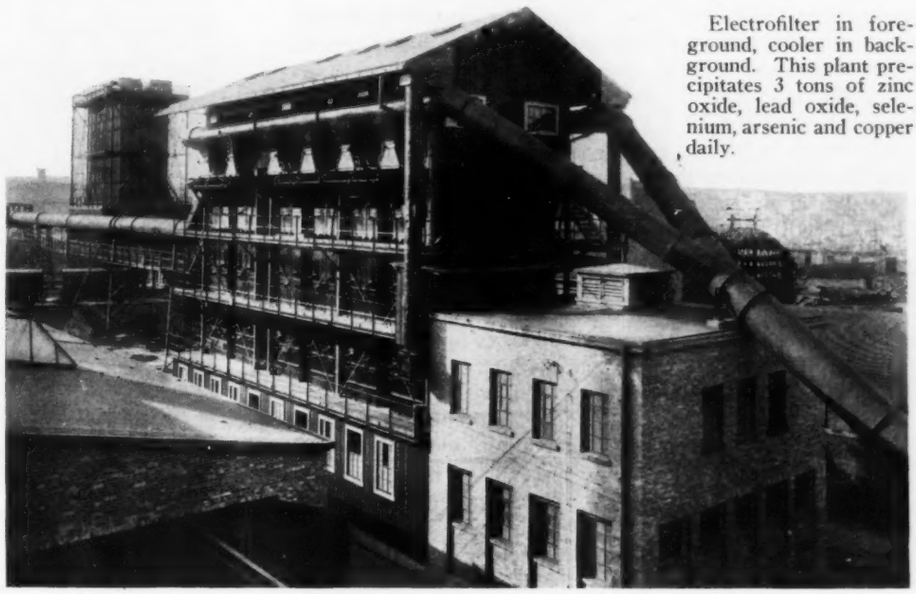
tures for electric precipitation. This temperature usually lies below 100 deg. C. (212 deg. F.) and varies with the composition and pressures of the gas treated. On leaving the cooling towers the gases are treated by two banks of six electrofilter chambers each. These vertical chambers are made of steel plates forming tall rectangular boxes. In these chambers hang the discharge and collecting electrodes. The discharge electrodes are suspended on special high-tension insulators mounted outside on the sides of the chambers. The dust falls to the bottom of the chamber into special hoppers and is discharged directly into railway trucks underneath.

The white brick building seen on the right edge of the picture contains the transformer, mechanical rectifiers, switchboard, and in general all the apparatus for the production of high-tension pulsating continuous current. The conductor carrying this high-tension current to the discharge electrodes is protected by the tall vertical pipe seen in the center of the photograph and leading from the top of the high-tension room to the top of the electrofilter chambers.

As stated before, the vertical rods along the casing of the chambers form part of the self-acting mechanism for rapping the electrodes. One chamber is rapped at a time and is automatically closed during this process so as to prevent the escape of the stirred-up metallic dust. During this time the gases pass through the two other chambers. This temporary overload of 10 per cent does not affect appreciably the efficiency of the filters.

The plant described recovers daily about 3 tons of metallic dust, half of which consists of zinc oxide and the rest of lead oxide, arsenic, selenium and copper. The purified gas leaving the electrofilter and containing a large percentage of sulphur dioxide is used for the manufacture of sulphuric acid by the Peterson tower process. Here again the influence of electric precipitation is felt, for the gas may be led straight into the towers of the acid plant, all the dust having been removed during the precipitation of the metallic particles. In the catalytic process of acid manufacture electrofilters have been used with success to remove all traces of arsenic and other metals likely to "poison" the catalyst. Even in the manufacture of sulphuric acid by the lead-chamber process, electric precipitation is being increasingly used to prevent the dust held by the roaster gases from obstructing the "glover" or denitrating towers and to obtain a pure translucent acid.

A section through an electrofilter for the treatment of such flue gases at temperatures as high as 450 deg. C. (840 deg. F.), is shown in Fig. 6. It will be noticed that the gases descend into an entrance expansion chamber, ascend in a middle chamber in which the electrodes are hung and finally descend into an exit chamber, whence they are led into the Glover tower.



Electrofilter in foreground, cooler in background. This plant precipitates 3 tons of zinc oxide, lead oxide, selenium, arsenic and copper daily.

Fig. 5—Precipitation plant for smelter

Where a gas contains several dispersed constitutents differing appreciably from one another in volatility, it is possible to precipitate them separately by taking advantage of their difference in volatility. For instance, it is well known that the distillation of coal produces large quantities of tar and light oil. This is the case in gas works, coke works, gas-producing plants and low-temperature distillation plants.

It is possible to precipitate the tar contained in the gases by lowering their temperature below 100 deg. C. (212 deg. F.) and letting the gases impinge violently on suitable surfaces to cause the tar dust to settle down. This method, however, involves high upkeep charges and the tar obtained contains dust and water, which lowers its commercial value. It is possible to obtain pure tar by electric precipitation in taking advantage of the difference of volatility of tar and water, as follows: the hot gases pass at about 400 deg. C. (750 deg. F.) through an electrofilter where the dust they contain is precipitated. Tar, being a vapor at that temperature, is not influenced by the electrostatic field. On leaving the filter the gases are cooled by a scrubber to about 100 deg. C. (212 deg. F.) and then pass through a second electrofilter. At this temperature tar is in the form of a light mist; under the influence of the electrostatic field it is precipitated on the collecting electrodes and runs down into a tank, while the water contained in the gas is still in the form of vapor and is unaffected by the electrofilter. The gas is then again cooled, but this time to 25 deg. C. (80 deg. F.) so as to precipitate most of the light oil and water—these separate of themselves on account of their difference in density. The pure gas may now be led long distances without danger of deposits choking up pipes. It can be used in all cases where only pure gas can be employed, as, for instance, in gas engines and in metal burners.

A tar electrofilter built by the Siemens company for the Oram Lamp Works is shown in Fig. 7. The chamber consists of a steel-plate rectangular box in which discharge and collecting electrodes hang; the casing is used also as a grounded collecting electrode. The gases are forced from the gas producers into the bottom of the chamber, whence they ascend between the electrodes and

leave through a large pipe at the top. The insulators supporting the discharge electrodes are fixed outside the chamber in hoods seen on the platform on both sides of the filter. The hoods are heated by steam pipes to prevent tar from condensing on the insulators. The high- and low-tension apparatus are located in the small room seen on the left of the figure. The wide pipe on the roof protects the high-tension wire feeding the discharge electrodes.

Blast-Furnace Gas

Purification of blast-furnace gases promises to provide the most spectacular application of electrofilters on account of the magnitude of the plant involved. Each ton of cast iron smelted is accompanied by the production of roughly 100,000 cu.ft. of gas, and the efficient utilization of such enormous quantities of gas plays an important part in the economies of the iron industry. A little less than half the gas produced is necessary for the preheating of the blast and the rest is utilized for power production in boilers or in gas engines. The gas entering the electrofilter may contain as much as one gram of dust per cubic foot.

In recent European practice it is considered that gas used for heating hot-blast stoves should not contain more than 0.1 gram of dust per cubic meter (4 milligrams per cubic foot), for gases containing a greater percentage of impurities are likely to leave deposits on the small flue ducts, thus diminishing the conductivity of the refractory material and eventually causing choking.

It is also considered that the gas supplied to internal-combustion engines should not contain more than 0.01 gram of impurities per cubic meter (0.4 milligram per cubic foot). This high degree of purification has recently been successfully attained by electric precipitation.* The results obtained have been so satisfactory that the present general tendency is to purify the whole of the gas produced up to 0.01 gram per cubic meter, irrespective of whether it is to be used for heating or for direct utilization in gas engines.

Besides its great cleanliness, low upkeep and easy attendance, the electrofilter has the advantage of occupying less space and consuming less power than plants working

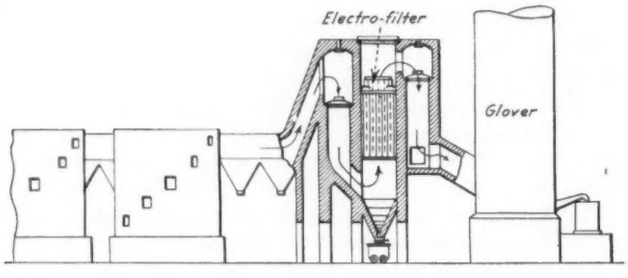


Fig. 6—Section of electrofilter used in purification of gases from pyrite roasting plant employed in manufacture of sulphuric acid

on other principles. In the case of blast-furnace elctrofilters the total energy required to feed the high-tension electrodes, to work the rapping mechanism and to drive the gas through the electrode chambers amounts to only 1.5 kw.-hr. per 100,000 ft. of purified gas.

The illustration (Fig. 8) gives a diagrammatic section through the type used for the purification of blast-furnace and the construction of this filter is very similar to that shown in Fig. 5. Its method of operation is as follows: The gases coming from the blast furnace are led in at the top; they pass down the first vertical chamber, where the greater part of the impurities are precipitated;

Fig. 7—Electrofilter for precipitating tar from producer gas

The high-tension room is on the left and the electrofilter at the right.

then up the second chamber, where the finer impurities are precipitated. As the gas is almost pure and fairly homogeneous in the second chamber, the discharge electrode can be charged at a higher potential than in the first chamber without reaching the flashover limit. Each electrode chamber is about 20 ft. high, 6 ft. long and 1 ft. wide. For the sake of clearness the filter shown in Fig. 8 contains only two electrode chambers. In practice, however, each electrofilter contains four or six chambers, of which two or three respectively work in parallel, so as to increase the capacity of each treater. Thus a unit of four electrode chambers can treat about 300,000 cu.ft. of gas per hour.

As very little has yet been published about manufacturing experience with large electric precipitation plants for such a high degree of purification, the following results obtained recently by Czechoslovakian steel works may be of interest, especially as the works possessed also a wet purification plant of equal capacity which could be compared with the electrofilter.†

Table I gives the operating costs of the two plants in cents per 100,000 cu.ft. (measured at normal temperature and pressure), the data covering observations extending over a period of half a year.

It is seen at once that the operating costs of electrical precipitation are only half of those for wet purification, owing to the low energy consumption and negligible water consumption. The plant can treat about 3,500,000 cu.ft. of gas per hour and costs altogether $85,000,

**A detailed account of the tests carried out on an electrofilter built by the Siemens company for the Dortmunder Union was published in 1926 in "Stahl und Eisen," Hochofenausschuss No. 74.*

†*See "Stahl und Eisen," Nov. 17, 1927.*

TABLE I—OPERATING COST, IN CENTS, PER 100,000 CU.FT. OF PURIFIED GAS (AT N.T.P.)

	Salary	Electric Energy	Water	Lubrication	Upkeep and Improvements	Miscellaneous	Total
Electric precipitation	2.2	6.4	0.1	0.1	2.4	0.6	11.8
Wet purification	2.0	15.0	4.8	0.2	0.8	...	22.8

TABLE II—ANNUAL COST, IN DOLLARS, OF PRECIPITATION AND WET GAS PURIFICATION PLANTS

	Electric Precipitation Plant	Wet Purification Plant
Amortization, at 10 per cent	8,500	8,600
Interest, at 10 per cent	8,500	8,600
Attendance	1,500	2,800
Improvements	1,500	800
Electrical energy, one cent per kw.-hr.	16,000	30,000
Cost of water, three cents per 1,000 gal.	.....	25,000
	36,000	75,800

whereas the wet purification plant of the same capacity costs $86,000, including settling basins, pumps, etc.

It is thus seen that, contrary to current opinion, an electric precipitation plant is not more expensive than the ordinary wet precipitation plant, if care has been taken to include everything connected with the plant and not merely the machinery as is too often done.

The annual cost of the two plants is compared in Table II, which shows that the annual cost of electric precipitation is roughly only half of that for wet purification owing to the large saving in power and in water costs.

Only a few applications of the electric precipitation process have been mentioned as it would be impossible to cover even incompletely the whole field of applications of this new branch of electrical engineering. It is, however, possible to determine whether electrofilters can be applied to any process by remembering that impurities or valuable products contained in a gas can be precipitated electrically if they are, or if they can be, converted into solid, liquid or even nebulous particles subject to electrostatic conditions.

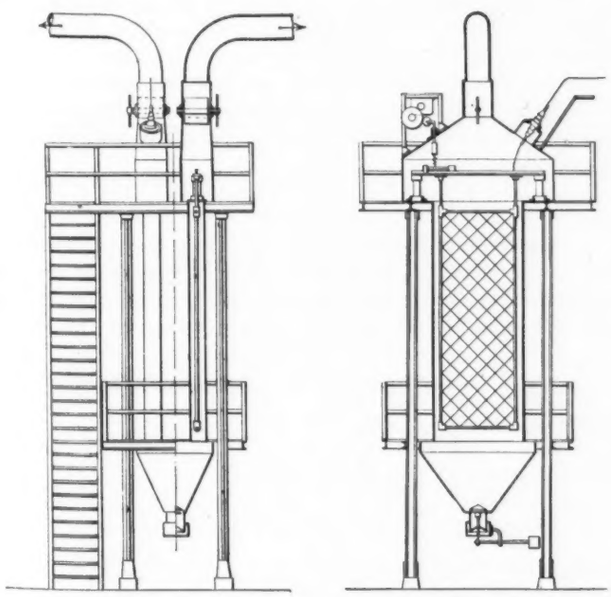


Fig. 8—Section view of a box-type electrofilter used to clean blast-furnace gases

From the few applications mentioned it will be gathered that electric precipitation may no longer be regarded as a scientific curiosity; it has become an industrial weapon and will play an important part not only in improving existing processes of manufacture but in creating new ones.

Appraising Effectiveness of Good Lighting

By M. Luckiesh

Director Lighting Research Laboratory, National Lamp Works of General Electric Company, Cleveland

IF USERS of light could be brought to the laboratory, it should be possible to convince them that improved lighting results in more and better work. In industrial field tests there is much difficulty in controlling factors other than lighting which influence production. Therefore the results of such tests are sometimes discouraging to the lighting specialist who had hoped to demonstrate worth-while gains. In cases which fail to show decisive advantage in the output of work as the result of better lighting the fault may lie in inability to measure the improvement, rather than in its absence. The difficulties encountered in measuring the effect of the lighting on the speed and accuracy of working can be summarized as:

1. The presence of disturbing factors which influence production but have no connection with the lighting conditions involved in the test.

2. The ability of the eyes to compensate for poor visual conditions at the expense of the workers. Since this increased effort is not measured, the difference between lighting conditions compared is lost.

However, both of these complications may be overcome. The disturbing and irrelevant factors can be equalized, if they cannot be eliminated, by carefully controlling the tests so that all factors present in one case are also the same in the other, thus leaving the lighting as the only differential factor. The solution of the problem presented by the compensation of the eyes for poor visual conditions, at the expense of the workers, is not so obvious. Laboratory experience has shown, for example, that when it is desired to measure a difference in speed of working resulting from two lighting conditions, it is necessary that the subject work at his maximum rate in both cases. Otherwise there is a margin, and when the poorer work condition is met the eyes simply "take up the slack" and a difference in output fails to appear. If the subject is working to the limit of his ability, this cannot happen. Of course, it would be experimentally ideal if we could govern the workers so that they worked at the same rate of "expenditure of effort," but as yet there is no way of measuring this highly uncertain element.

The human machine is complex, and even in a simple operation performed by the worker many physical and psycho-physiological factors are involved. However, it is an outstanding fact that all of our controlled laboratory investigations show that better vision is possible and more work is done when the lighting is improved. This fact should not be ignored, regardless of apparent results in a "practical" field test of limited duration and with many human factors at present uncontrollable and subject to diverse limitations.

Transformer-Bank Capacity

Time saving in calculating the operation of delta and "vee" banks by assuming equal percentage impedance

By H. B. Dwight* and E. G. Allen†

If ONE transformer of a delta bank is taken out of service, because of a burn-out or other cause, it is well known that the rating of the remaining "vee" bank is 58 per cent of the rating of the complete delta bank. If, however, two unequal delta banks are in parallel and one single-phase transformer is taken out, the permissible load for the remaining transformers depends on which of the connections (A, B, C or D) of Fig. 1 is used.

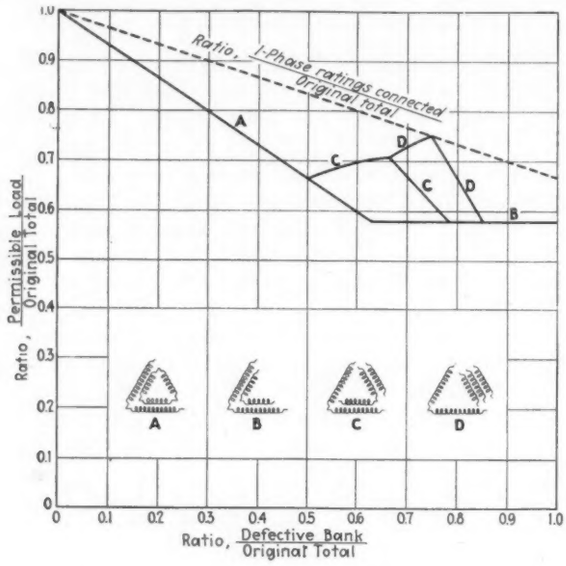


Fig. 1—Curves of permissible loading of transformer banks after loss of a single-phase transformer

Example.—4,500-kva. and 5,500-kva. delta banks connected as in A, with one 1,500-kva. transformer cut-out:

$$\frac{\text{Defective bank}}{\text{Original bank}} = \frac{4{,}500}{10{,}000} = 0.45$$

Permissible load, from curve = 0.7 × 10,000 = 7,000 kva.

For such a case it may be assumed that the percentage impedance of the transformers is the same, since they are operating in parallel. This makes it possible to draw a simple set of curves of permissible loadings, shown in Fig. 1, which may be used instead of making calculations.

The curves are derived from the following expression, presented in this article for K_o, the permissible rating of a bank, the kva. ratings of whose sides are K_1, K_2, and K_3 of which K_1 is the smallest:

$$K_o = \frac{1.732\ (K_1K_2 + K_2K_3 + K_3K_1).}{\sqrt{(K_2^2 + K_2K_3 + K_3^2)}}$$

The side which is first overloaded as the load on the banks is increased is the smallest side K_1. This gives the largest possible value of the denominator of (1) and the smallest value of K_o, since the numerator is the same no matter which side is first overloaded.

K_o, K_1 etc. can be expressed in actual kva. or in ratios of the original total kva., as desired. Their values can be written by inspection of diagrams, A, B, C or D. Thus, if in diagram A the capacity of the defective bank is 0.45 times the original total, $K_1 = 0.55/3$, $K_2 = 1/3$ and $K_3 = 1/3$, these being single-phase ratings. Then

$$K_o = \frac{1.732\ (0.55 + 1.0 + 0.55)}{3\sqrt{(1 + 1 + 1)}} \qquad (1)$$

= 0.7 time the original total. (See the example under Fig. 1.)

In explanation of the curves, the straight line A gives the permissible load which may be carried without overloading any part when one single-phase transformer has been removed, leaving the remainder connected as in diagram A. The delta part of diagram A may be made up of two or more delta banks in parallel. Thus, Fig. 1 applies to several banks of transformers in parallel and not merely to two.

For diagram A, the permissible load is equal to the rating of the complete delta bank plus the rating of one single-phase transformer of the "vee" bank. If the defective bank, however, is more than 63 per cent of the total, it is better not to use diagram A, since it results in less than 58 per cent of the total rating.

Diagram B can always be used, as it involves merely disconnecting the remaining transformers of one phase, giving a straight "vee" connection.

Diagram C involves special wiring outside of the transformers, or it involves wheeling the defective transformer out of its place and wheeling one of the other transformers into the vacant place.

Diagram D involves special wiring. If the large transformers of diagram D have three times the rating of the small ones, the permissible load is equal to the sum of the ratings of the single-phase transformers, thus giving 100 per cent "apparatus efficiency."

The short curves C and D of Fig. 1 are parts of longer curves or lines. Thus, the left-hand part of D curves downward so as to pass through the point (0,0) and the right-hand part of D is a line passing through the point (1,0.33). Only those parts of the lines have been drawn which would probably be used in practical operation of transformer banks.

Loading of Delta Banks

A matter not illustrated in Fig. 1 is the permissible load of a delta bank with a spare single-phase transformer connected across one of the phases. The permissible load is 109 per cent of the rating of the delta bank, when the four transformers are duplicates and the spare transformer is connected in parallel with one phase of the delta. If the four transformers are connected in double "vee"—that is, with two "vees" in parallel—the permissible load is 115 per cent of the rating of the delta bank. The latter arrangement would give a somewhat more unbalanced voltage than the former.

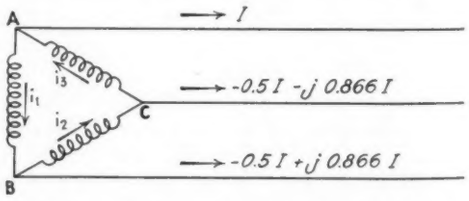


Fig. 2—Currents in delta transformer bank

When a delta bank becomes overloaded and a spare transformer is available, it may sometimes be good engineering to use the spare to relieve the overload, increasing the rating of the bank as just described. The reserve capacity of the spare transformer is not sacrificed by

*Massachusetts Institute of Technology.
†Stone & Webster.

doing this, for trouble usually happens to only one single-phase transformer at a time.

To determine the currents in a delta bank, assume that a balanced three-phase load current is taken from the bank. The currents in the three lines A, B and C may be represented as follows:

$$I_A = I.$$
$$I_B = -0.5I + j0.866I.$$
$$I_C = -0.5I - j0.866I.$$

If j quantities are plotted at right angles to real quantities, representing 90 deg. difference in phase, the above three currents will be seen to be equal in magnitude and 120 deg. apart in phase.

Let the current in transformer AB, which is unknown, be

$$i_1 = i_p + ji_q$$

in the direction AB. The currents in the other transformers may be derived from i_1 and are:

$$i_2, \text{ in direction } BC = i_1 - iB$$
$$= i_p + ji_q + 0.5I - j0.866I.$$
$$i_3, \text{ in direction } CA = i_1 + iA$$
$$= i_p + ji_q + I.$$

If the resistance and reactance of each transformer is inversely proportional to its rating, the impedance of the first transformer can be written

$$\frac{R}{K_1} + j\,\frac{X}{K_1},$$

where K_1 is the kva. rating of side AB of the delta. Using similar expressions for the other sides of the delta, the impedance drops in the transformers are:

$$\text{Drop in } AB = (i_p + ji_q)\left(\frac{R}{K_1} + \frac{jX}{K_1}\right).$$

$$\text{Drop in } BC = (i_p + ji_q + 0.5I - j0.866I)\left(\frac{R}{K_2} + j\,\frac{X}{K_2}\right)$$

$$\text{Drop in } CA = (i_p + ji_q + I)\left(\frac{R}{K_3} + j\,\frac{X}{K_3}\right).$$

Since these transformers are connected in delta and are assumed to have balanced voltages impressed on them, the sum of the above three drops is zero; that is, the sums of the real and imaginary parts are each equal to zero. Therefore:

$$i_pR\left(\frac{1}{K_1} + \frac{1}{K_2} + \frac{1}{K_3}\right) - i_qX\left(\frac{1}{K_1} + \frac{1}{K_2} + \frac{1}{K_3}\right) = I\left(\frac{0.5R}{K_2} + \frac{R}{K_3} + \frac{0.866X}{K_2}\right) \quad (2)$$

$$i_pX\left(\frac{1}{K_1} + \frac{1}{K_2} + \frac{1}{K_3}\right) + i_qR\left(\frac{1}{K_1} + \frac{1}{K_2} + \frac{1}{K_3}\right) = I\left(\frac{0.5X}{K_2} + \frac{X}{K_3} - \frac{0.866R}{K_2}\right) \quad (3)$$

Eliminate i_q by multiplying (2) by R and (3) by X, and divide by $R^2 + X^2$.

$$i_p\left(\frac{1}{K_1} + \frac{1}{K_2} + \frac{1}{K_3}\right) = I\left(\frac{0.5}{K_2} + \frac{1}{K_3}\right)$$

Similarly,

$$i_q\left(\frac{1}{K_1} + \frac{1}{K_2} + \frac{1}{K_3}\right) = -\frac{0.866I}{K_2}$$

Let AB be the first side of the delta to be overloaded. Then

$$I_p^2 + i_q^2 = \frac{K_1^2}{E^2}$$

where E is the rated voltage.

Let the permissible load be K_0 in kva.

Then $I = \dfrac{K_0}{E\sqrt{3}}$

$$\frac{K_1^2}{E^2}\left(\frac{1}{K_1} + \frac{1}{K_2} + \frac{1}{K_3}\right)^2 = \frac{K_0^2}{3E^2}\left(\frac{0.25}{K_2^2} + \frac{1}{K_2K_3} + \frac{1}{K_3^2} + \frac{0.75}{K_2^2}\right)$$

$$\frac{K_0\sqrt{(K_2^2 + K_2K_3 + K_3^2)}}{K_2K_3} = 1.732K_1\,\frac{(K_1K_2 + K_2K_3 + K_3K_1)}{K_1K_2K_3}$$

$$K_0 = \frac{1.732(K_1K_2 + K_2K_3 + K_3K_1)}{\sqrt{(K_3^2 + K_2K_3 + K_3^2)}},$$

which is equation (1).

If it is desired to calculate the allowable load for more general conditions, as when the resistances and reactances are not inversely proportional to the transformer ratings, or when the load is unbalanced, a longer calculation is required than merely using equation (1). See the chapter on transformers by C. L. Fortescue in the "Standard Handbook for Electrical Engineers" and the articles "Dissimilar Transformers in Delta," by J. B. Gibbs, *Electric Journal*, September, 1917, page 356, and "Loading a Bank of Dissimilar Transformers," by H. B. Dwight, ELECTRICAL WORLD, Aug. 2, 1919, page 230.

Load-Dispatching Problems and Procedure

BY F. R. GEORGE
Engineer of Operation Pacific Gas & Electric Company, San Francisco, Calif.

IN OPERATING any power system, regardless of size, the goal toward which all companies strive is maintenance of continuous, perfectly regulated service to all customers at minimum cost. The transmission system of the Pacific Gas & Electric Company, perhaps, has a greater mileage of high-voltage lines receiving power from a larger number of sources than any other system in the world. Some idea of the extensiveness of this system may be had from the accompanying table and the fact that a total of 506,987 electric customers are served in 38 counties embracing an area of 59,000 square miles in northern and central California.

Continuity of service on such a system requires unremitting vigilance intelligently directed and controlled on the part of the operating organization and entails a vast amount of specialized effort on the part of the men bearing the immediate responsibility. To accomplish the desired result the Pacific Gas & Electric Company adopted the centralized control idea in about 1900. After various experiments along these lines there was established, in October, 1906, a separate department for this phase of system operation under the title of "Load Dispatcher." At the outset this branch was a one-man organization, but the rapid growth of the system soon rendered it impossible for any one person to perform the multifarious duties of a control center, and it has been necessary constantly to increase the department personnel to keep pace with the system growth.

SYSTEM DATA FOR PACIFIC GAS & ELECTRIC COMPANY AS OF DEC. 31, 1927

Number of hydro-electric plants	32
Number of steam plants	9
Installed capacity, hydro plants, hp	621,213
Installed capacity, steam plants, hp	206,266
Total installed plant capacity, hp	827,479
Hydro generation, 1927, Kw.-hr	1,484,000,000
Steam generation, 1927, kw.-hr	15,567,000
Power purchased, 1927, kw.-hr	745,815,000
Total electric customers	506,987
Miles transmission lines, 220 kv	420
Miles transmission lines, 110 kv	1,205
Miles transmission lines, 60 kv	2,600
Miles transmission lines, 30, 22, 20 kv	160
Miles transmission lines, all voltages	4,385
Miles distribution lines, 2 kv.–17 kv	13,815
Number of substations	305
Number of substations supplied by lines over 20 kv	220

Authority and responsibility are centered in one office, and from this point emanate all orders regarding load, frequency and voltage regulation; disposition of stored waters; energy purchased from other companies; switching on all high-voltage lines and all tie lines between stations regardless of voltage, and kindred matters having to do with system operation.

The ramifications of dispatching duties are many and varied. Control of the system load regulation necessarily involves the preparation of load estimates and loading schedules as well as constant supervision, in order that the most economical distribution of energy may be made under all conditions. Handling of stored waters necessitates a careful check on rainfall and snow cover and precipitation conditions throughout the season. Supervision of energy purchases from other companies calls for daily recording and checking of deliveries as well as responsibility for the correctness of monthly contract re-

quirements, etc. Contact between interconnected companies in operating matters is entirely through the load dispatcher's office. Responsibility for transmission line operation entails general supervision over routine switching, patrolling, maintenance and construction work, as well as the location and clearing of system trouble, etc. In this connection the load dispatcher also acts as a clearing house for the relay and protective system of the company, keeping records of installation, operation and all tests, and initiating investigations on faulty or questionable operations of the protective system.

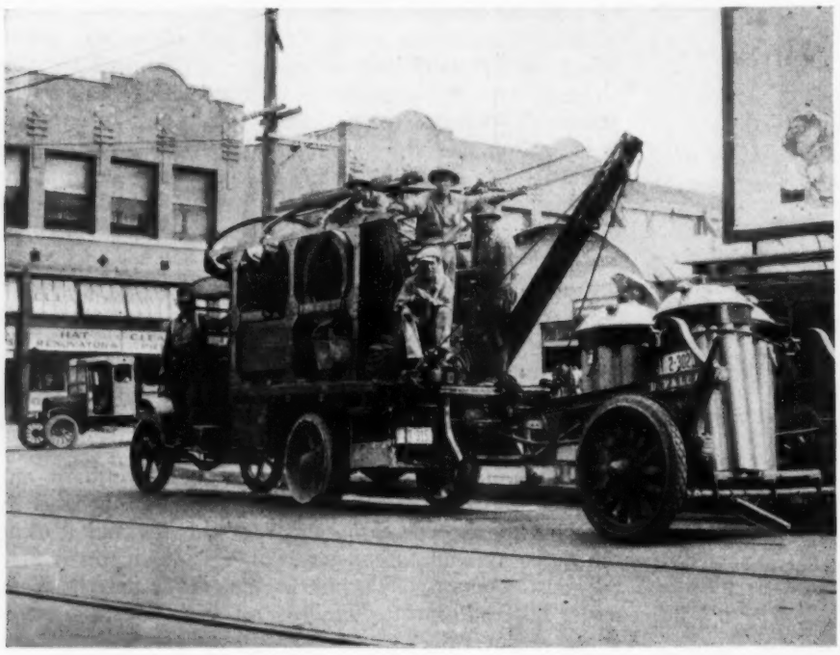
All oil and air circuit breakers controlling transmission and distribution lines operating at voltages above 4,000 are designated by number or by a combination of letters and numbers, which are assigned by the dispatching organization and used in all orders and instructions regarding the operation of such breakers. Maps and diagrams carrying these designations are furnished to all station operators as well as to the dispatchers, and every switching operation on high-tension circuits is checked as to switch numbers before it is performed.

The success of such an operating scheme is in a large measure dependent upon the efficient use of a comprehensive system of communication. As the company's electrical system has grown, there has developed with it a complete communication system. The lines comprising this system connect with practically every power house, substation and switching point in the transmission network, as well as with storage reservoirs, ditch camps and other strategic points. Most of these privately owned telephone lines are available to the dispatchers through direct connection and are supplemented by long-distance circuits leased from the Pacific Telephone & Telegraph Company and by a carrier-current radio-telephone installation, giving the dispatching force constant touch with any desired point.

Self-Priming Pump Assures Quick Pumping of Manholes

FOR quickly pumping manholes which have become filled with water and especially where construction must proceed rapidly the United Electric Light & Power Company, New York, uses a self-priming pump. The pump is mounted on the underside of the truck chassis, as shown in the illustration, and is operated through a power take-off by the truck engine. The company finds that with a self-priming pump no time is lost in getting a suction so that the manhole can be quickly pumped, allowing construction or repair work to proceed rapidly. La Bour centrifugal self-priming pump is used.

Handling Underground Network Transformers



Crane truck and transformer trailer

Lowering into vault

The above pictures show the equipment and method in use on the system of the Dallas Power & Light Company, Dallas, Tex., for handling transformers in the underground network system.

Semi-Flexible Tower Line

to Meet Severe Conditions

Conductors in horizontal plane with single circuit per tower. Line built in structural units with anchor and intermediate towers

By CLYDE A. BOOKER

Engineering Department, New England Power Company, Worcester, Mass.

SINCE 1921 the New England Power Company has followed the policy of constructing all its important lines with all conductors in a horizontal plane. No part of the system is entirely free from the likelihood of sleet accumulation. The great majority of service interruptions during sleet storms were long ago discovered to be due to burndowns of vertically arranged conductors caused by a short circuit on the whipping wire, when a sleet formation suddenly dropped from a lower wire. The obvious correction for this most serious cause of interruption is the horizontal separation of conductors so that no wire is vertically over any other wire. It is the feeling of the company's engineers that the conventional offset at the middle crossarm is not adequate protection in this territory because a moderate wind will cause the wires to blow into the same slightly inclined plane, and in any case the wires in whipping have a certain lateral as well as vertical movement. Also, theoretical treatment of conditions known to have existed indicates that the vertical movement may be great enough to bring the bottom wire within striking range of the top wire.

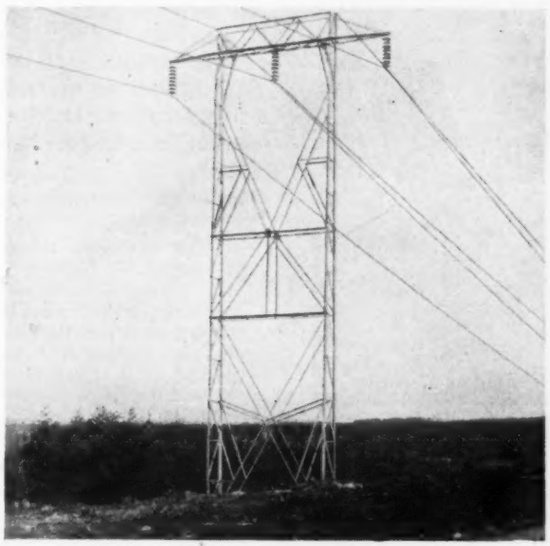


Fig. 1—Semi-flexible intermediate tower

The accumulated evidence of burned pairs of conductors near the centers of spans led to these conclusions about five years ago. It was definitely known that these burns occurred during ice storms, because nearly every year various persons had seen the ice drop simultaneously from the entire length of the bottom phase on one span, and the wire, its load being suddenly released, whip into the phase above with the consequent flash between conductors. The least expensive type of construction to meet the above policy is the single-circuit wooden pole "H" frame, which has been developed for a large variety of needs. This type of construction, however, does not provide for the permanency of materials needed on a trunk line of large capacity which can be removed from service for repairs only with great difficulty.

In 1923 the company decided to construct the 60,000-hp. Davis Bridge hydro development with its 75-mile, double-circuit, 110-kv. trunk line to the Millbury load center. It was known that the line would pass through certain sections where the formation of sleet is prevalent, and that from the start it would be heavily loaded. It was therefore felt that the line must be built of steel so designed that there could be no interference between conductors and with ample strength in the tower to stand up even if the strength of conductors should be overtaxed by a superimposed ice and wind load. This led to the use of a tower having the six conductors arranged horizontally on a single 62-ft. crossarm, a construction with which most readers are now familiar.

At the time there was much debate as to whether or not any overhead ground wires would be installed, with a final decision to design the structures for two, one at each bent, but to install only one, principally to be certain of positive relay action. Although at the time it was thought that the protective value of the ground wire against lightning was problematical, it has proved in three years of operation to have reduced the outages of the protected circuit to a ratio of about one to three as compared with the unprotected circuit. This ratio was noticed in the first year of operation and studies were immediately undertaken with the General Electric Company, which have thus far shown that the maximum induced lightning voltages are greatly reduced in the horizontal design because all conductors are kept closer to ground than usual. It was also observed that a second ground wire should improve conditions on the most exposed conductor by about 30 per cent, with greater benefits from a larger multiplicity of ground wires.

In 1926, when it became desirable to construct a

110-kv. connection between Millbury and the line of the Edison Electric Illuminating Company of Boston from the Edgar station at Weymouth to West Medway, these facts had been demonstrated. Although this line was to be used for the interchange of large blocks of energy between the two companies, it was felt that with the above knowledge at hand a single circuit could be designed to give very satisfactory service. While the 250-ft. rights-of-way for this and future companion lines were being purchased a study was entered into to deter-

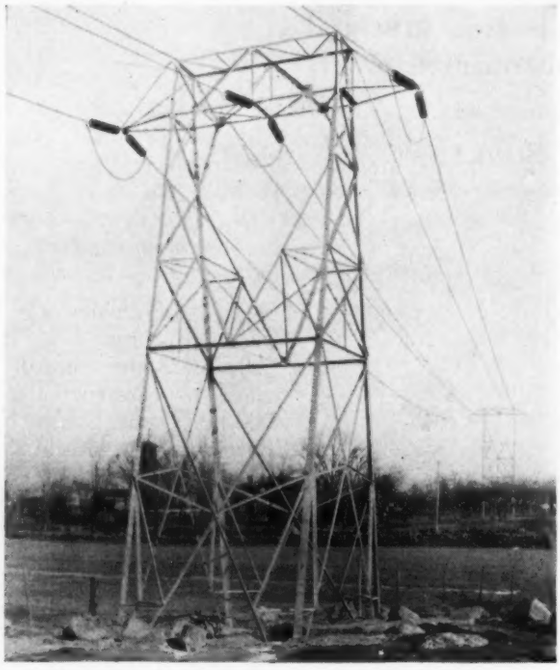


Fig. 2—Anchor towers terminate each structural unit

mine the type of construction best suited to the conditions. One fact already in hand was the knowledge that the double-circuit horizontal type tower line is as economical over a period of years as two single-circuit wooden pole "H" frame lines of similar characteristics, its increased first cost and interest being compensated for by the greatly reduced maintenance and depreciation charges. Unless the need for a second circuit is in the immediate future it is not economical to build a double-circuit tower line with only three conductors erected, because 80 per cent of the total ultimate investment must be made at once.

This clearly indicated the desirability of perfecting a type of single-circuit steel line to cost about one-half the completed cost of the double-circuit line. One circuit of this type could be built and additional circuits added without penalizing the first line with temporarily unused structure capacity or increasing the ultimate capital investment for two or more circuits. At the same time the permanency of materials desirable on important lines could be secured as well as the added advantage of structurally independent circuits.

The notable success of the company's various "H" frame lines in withstanding recent sleet formations which caused considerable trouble on vertically arranged tower lines indicated that success in solving this problem lay in the development of the "H" frame in steel. The foregoing explains the principal reasons for the design and use of the single-circuit, semi-flexible tower.

The fundamental principle governing the design of this type of line is its division into a series of independent structural units. Each unit consists of two anchor towers and one or more intermediate "H" frame suspension towers, the exact number of which is determined by the topographical conditions, but is never allowed to exceed seven. Each structural unit also includes two high-strength steel ground wires (one at the top of each tower bent) strung between anchor towers and securely fastened to each intermediate tower for the purpose of transferring any unbalanced longitudinal load from an intermediate tower to the nearest anchor tower.

The conductors are No. 4/0 H. D. stranded copper sagged to reach a tension of 4,000 lb. under Class "B" load, which provides an excess of strength to take a much greater load without actual breakage of the conductor. This sag, combined with the beneficial results of keeping the average ground clearance as low as possible during lightning storms, dictated the use of a normal span 600 ft. in length and towers 50 ft. in height.

These Functions Required of Intermediate Towers

Its working relation with the other component parts of a structural unit require the following three functions in an intermediate tower:

1. To support the vertical weight of ground wires and conductors with superimposed ice load, if any, and excess load due to vertical angles or extraordinary formation of sleet.
2. To withstand transverse wind loads on the structure as well as one-half the wind load on all cables in each adjacent span.
3. In case of unbalanced longitudinal loads, due to a broken conductor or otherwise, the structure must have strength between the crossarm and the top to transfer the heavy shear as well as flexibility so that the tower will back away from the the load until equilibrium is re-established by the tightening of the wires on one side and the slackening of those on the other.

Because of the varied topographical conditions encountered in New England, the maximum span on a line usually exceeds the average span by about 60 per cent, so that above functions were resolved into the loads for a span 1,000 ft. long and comparative investigations were made of several designs. The final choice of designs was based on practical considerations of the requirements for field erection quite as much as an economy of steel, although both happened to be combined to the greatest extent in the latticed angle structure having a single footing for each pair of legs. The intermediate structure as actually used is illustrated (Fig. 1). Its weight, including earth grillages, is approximately 4,100 lb.

In order to preserve maximum flexibility all intermediate towers are set on earth grillages, solid rock being excavated in preference to using the rigid foundation of the ordinary rock shoe. It has also been found that this procedure works out about as economically as the method requiring the use of grouted anchor bolts and a small concrete pier, which are very expensive on cross-country work.

These towers, while flexible under heavy longitudinal load, are sufficiently rigid so that they are erected piece by piece from the foundations up as cheaply as they could be assembled in the prone position and ended up. In fact, the line went through an extraordinarily severe longitudinal windstorm before any wires were attached without injury to any of the towers. It was also found that all five wires can be strung at the same time without difficulty.

Although the successful design of this type of line rests with the intermediate tower, successful functioning

of the line is quite as dependent on the ground or longitudinal guy wires and the anchor towers. The comparatively small number of anchor towers and their function of relieving the intermediate towers of all longitudinal loads justifies the use of a structure designed (Fig. 2) to break all conductors and ground wires when pulling at their ultimate strength. In this way the destruction which would be caused by the unlikely breakage of all wires in one span is confined to the intermediate towers of a single structural unit which will never exceed seven in number or less than one mile of line. This maximum spacing between anchor towers is arbitrarily picked to prevent the longitudinal oscillations of flexible towers which have given trouble on long unbroken sections of "A" frames as well as to limit the extent of any possible catastrophe.

The ground wires are made to serve two important purposes: First, to act as longitudinal guys for the intermediate towers; second, to reduce the voltage gradient of lightning disturbances. Their mechanical strength is proportioned so that if any or all conductors on one side of an intermediate tower are broken under Class "B" load the load will be transferred back to an anchor tower. The studies of the General Electric Company have shown that the conductivity of the ground wire has little effect in lightning protection. Therefore, $\frac{3}{8}$-in. diameter extra galvanized crucible steel cable was selected for use with No. 4/0 copper conductors.

In order to maintain a 13-ft. 6-in. horizontal spacing of conductors the usual rolling transposition is eliminated by making the necessary connections at an anchor tower equipped with a special crossarm. The difficulty of doing this was increased by the presence of the two ground wires and its solution is best described by reference to the illustration Fig. 3. At large angles in the line the special anchor towers are designed to take the transverse load with all wires in position and pulling at their ultimate, in addition to the other loads for the regular anchor tower.

All towers are designed to provide the usual clearance to ground with an insulator swing 45 deg. from the vertical, but greater clearances are allowed for with a swing 25 deg. from the vertical, which is the largest likely to occur during a lightning storm, when the probability of flashover is greatest. Towers are very carefully located by profile to guard against uplift of insulators on towers placed in depressions. It is probable that this type of line can be adapted to a large range of voltages, inasmuch as we have encountered no difficulty in designing for 150,000 volts.

The recapitulation below gives in brief form the statistics of the line and type of construction discussed previously.

Since the Millbury-West Medway line was completed field tests have been conducted to obtain by experiment the degree of flexibility of the intermediate tower. This has been determined to be about 30 in. maximum when the tower is mounted on rigid foundations and considerably more if the standard earth grillage is used. One interesting and important fact is that after longitudinal failure of the tower on rigid foundations had occurred the tower stood a 200 per cent transverse overload with

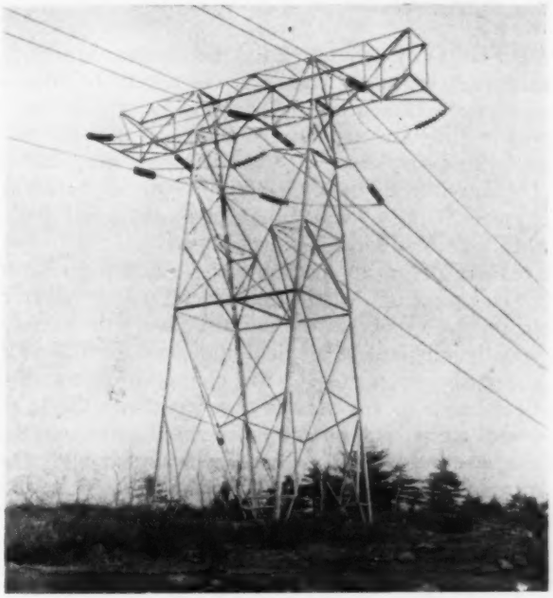


Fig. 3—Transposition connections are made at a special cross-arm on an anchor tower

150 per cent of the design vertical load on. While theoretical treatment of broken wire loads has shown that the maximum expected deflection is about 24 in., it is reassuring to know that even with longitudinal crippling the tower still will easily support the vertical weights and transverse loads.

The type of construction above discussed proved so attractive and practical that the company has since completed the construction of a second similar 20-mile line between Ayer and Tewksbury, Mass., for service in the Lowell and Lawrence territory. While this is designed and installed for 110,000 volts, service will temporarily be at 66,000 volts, for which reason it is confidently expected that unusually good service will be enjoyed.

Features of Millbury-Medway Line

1. Length of line, 16.55 miles.
2. Voltage, 110,000, 60 cycle, one circuit.
3. Number of anchor and angle towers, 28.
4. Number of intermediate towers, 115.
5. Conductors, three No. 4/0 A.W.G., seven-strand H.D. bare copper.
6. Ground wires, two $\frac{3}{8}$-in. galvanized crucible steel strand.
7. Insulation, eight and nine ten-in. standard disks.
8. While intermediate towers are designed for flexibility under longitudinal load, sufficient rigidity is secured to win workmen's confidence.
9. Earth grillages are used exclusively on intermediate towers to preserve ground line flexibility.
10. The two high-strength ground wires used for mechanical stability also distinctly improve voltage gradient during lightning storms.
11. Circuits are structurally independent and separated far enough so that electrical troubles on one should not affect the other.
12. Anchor towers are designed as absolute stops in line.
13. Anchor towers are used often enough to prevent longitudinal oscillations.
14. Large clearances from conductor to steel are provided under the normal insulator swing expected during lightning storms.
15. Single-circuit line can be constructed for approximately one-half the cost of double-circuit line having same improvements.

Preparing Estimates for Line Extensions

Plan for routing service applications according to rigid schedule involves ledger record of original form. Engineering department analysis and sketch simplifies work. Sales department arranges financing

By F. M. Sherry
Virginia Electric & Power Company

A METHOD of procedure for the preparation of line extension estimates that has been notably successful has been developed by the Virginia Electric & Power Company. Line extensions are made as a result of a request by a prospective customer for service, and involve the activities of the distribution engineer, estimator, civil engineer, right-of-way agent, plant clerk and draftsmen before construction is started.

The course of an application for service from a prospective customer or electrical contractor from its arrival in the company's office to the initial delivery of electrical energy at the customer's meter is indicated as follows:

If the customer writes to the company or comes to the offices and asks for service at a location hitherto not served with electricity, a form is filled out stating exactly what the customer wants, where he wants it and when he wants it. A different inquiry form is used by electrical contractors, which is supplied them by the company as a postal card. The latter is a recent development, used largely because of convenience in handling. When received, the information is copied on the customer's form by the sales department, and all such sheets are forwarded to the distribution engineering department in triplicate by way of the customer's files, a sub-department functioning for the benefit of the sales, accounting and installation departments. One copy initiates the new customer's file, and the two other copies are passed on to the distribution engineering department. Here the inquiry is recorded in a ledger and receives a number. This book supplies a permanent record of the inquiry from beginning to end, showing the dates of accomplishing various steps in its completion.

Engineers Specialize Their Work to Facilitate Action

The inquiries are then passed on to the engineers, who have different territories and special lines. The community is divided for street lighting, large power installations requiring high voltage, underground construction and territorial work. This system of allotment of territory and specialization is used to advantage, for the particular engineer can lay out ideas and follow them through as regards the general plan in his territory, and as he knows the streets and roads, he can go from one location to another with a minimum of lost motion. These engineers, by covering the route, ascertain how the company can serve the customers and at what point on the structure the electrician should bring his entrance.

A sketch is made on the reverse side of the inquiry sheet and distances are either stepped or else the odometer of the car is used. In underground work or other work demanding careful measurements the distances are chained. The present and planned construction is shown in this sketch. When the engineer returns to the office, he separates the inquiries. Those from electrical contractors, requiring points of entrances, character of service, etc., are first answered on a form that is typewritten and forwarded to the sales department for mailing to the customer or contractor.

All services that are readily available from the company's lines without further work are then written up on a form similar to the inquiry sheet. Estimate preparations are started by drawing a sketch and, by means of various symbols, the construction is mapped out, the memorandum sketch on the inquiry sheet being used as a guide. The line department uses this sheet in construction work, so that an accurate, neat sketch is essential for the successful application of the plan.

Estimate sheets are of three forms, one for overhead 2,300-volt lines, one for underground work and one for special work such as higher voltage overhead lines, street lighting, etc. Material prices are obtained at regular intervals from the storeroom, and only latest figures are used. Each engineer is furnished with a price sheet. The estimate forms are so arranged that the various improvement and operating accounts can be properly shown and expenditures allocated. This feature is helpful to the line department when making requisitions for materials. On the form used for answers to inquiries, all data that can be unearthed and that may be helpful to the person approving the estimate are placed under the heading of "Remarks for the Company."

Sales Department Handles Negotiation of Costs

The estimate is now typewritten and three copies are made, the line copy or original, the engineering copy and the sales department copy. The engineering copy is a duplicate of the line copy and is used as a file record, whereas the estimate is in the hands of the line department. If the original is lost, it can be easily duplicated. The line and sales copies are forwarded to the superintendent, who either approves them or returns them for correction. If approved, he forwards the sales copy to the sales department, the representative of which confers with the customer relative to the distribution of the charges unless the cost is small or the volume of load to be obtained justifies the expenditure of the estimated amount.

When the local sales department has completed its negotiations, it sends a letter to the superintendent stating the arrangements for distribution of charges and giving the authority to proceed. The superintendent then gets authority from the management for the expenditures and forwards the line copy, which he has held up to this time, to the distribution engineering department with a copy of the authority. Then all permits are applied for, rights-of-way obtained, and, when all conditions of the estimate have been met, the line is staked and the work sent to the line department.

The construction is begun as soon as possible, the meter order made out and the installation inspected by the installation department; the meter order is then forwarded through the distribution engineering department to the line department for action. Inspection by the engineer who prepared the estimate is the final step and is done when the line copy of the estimate is returned stamped as completed. This copy is then stamped as inspected, with the date, and after the newly built lines are entered on the circuit maps, the entire file is placed in the records.

Financing Enters New Phase

Refunding high-rate issues largely completed. Preferred stocks and unsecured obligations to play larger part

By H. M. CAMERON
Financial Editor

NOTWITHSTANDING the prevalence still of large numbers of high-grade utility bond issues bearing coupon rates of 6 per cent and over, the process of refunding high-priced issues may be regarded as largely completed. There are evidences that the industry is entering upon a new stage in financing policy. It is highly probable that unsecured obligations and stock issues will figure much more prominently during coming months, just as bond financing has played a leading part in the past two years.

Revolutionary changes have taken place during the past decade in the financing of public utility companies. In the closing days of the war utilities of high standing were paying 8 per cent for junior money and 7 per cent for mortgage-secured senior capital. Such a rate, presumably, was quite normal, considering earnings and the public apathy toward utility securities. In the industry, however, great strides were taking place in consolidation, interconnection and transmission. Aggressive management policies, also, gradually being introduced, were contributing steadily to increased earnings and the strengthening of equities behind bond issues. This was promoted by the gradual acquisition of subsidiary properties and by the strengthening of their financial structures. Frequently these acquired units had water rights whose development, not then warranted by the volume of business, proved exceedingly profitable later. This period added immeasurably to the strength and national importance of the utilities. It distributed risk and added the factor of diversification. The public utility industry was virtually reorganized during the period.

MONEY RATES TEND DOWNWARD

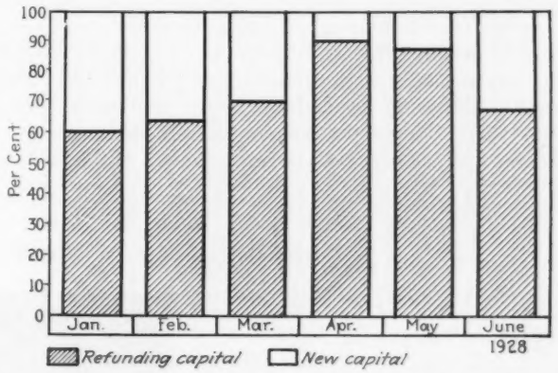
In the interval two more or less external factors operated in favor of the utilities. Long-term money rates were slowly but steadily declining from their post-war peak, and large institutions as well as the general public were developing a keen demand for public utility securities. This latter was not wholly external, since banking interests close to certain utility groups were carrying on large-scale educational campaigns on the relative merits of utility issues as compared with other classes of securities.

Under these favorable auspices—lower money rates, wider markets, higher earnings and stronger equities, refunding old issues and the simplification of capital structures went on apace. In 1926 about $380,000,000, or 27 per cent of all capital raised by the power and light industry, was for refinancing purposes. In 1927 the refunding total was $879,000,000, or 41 per cent of the total. During the first half of 1928 refinancing called for over $586,000,000, or 77 per cent of all financing exclusive of the issue of rights to shareholders. The process involved a saving to the industry of from 1 to 2½ per cent in interest and dividend charges.

Why the continuance of the 6 per cent issues referred to in the first paragraph? Some, of course, are not callable. Some again are too near the maturity date to warrant the refunding operation. Three or four years are frequently required to allow the economy differential to overtake costs incidental to refunding.

TREND TOWARD STOCK FINANCING

It is not intended to give the impression that all or nearly all capital raised during the period was through senior financing. In 1925, for example, there was a distinct swing over to junior financing which accounted for 61 per cent of the year's total. Neither is it the intention to give the impression that any immediate and complete cessation of senior financing in connection with refinancing operations is to be anticipated. There is still a considerable volume of refunding to be completed. But, as already indicated, the industry appears to have entered upon a stage of greater activity in financing through preferred stocks and unsecured obligations. An analysis of financing statistics since 1925 seems to indicate that the zenith was reached in this type of financing during the spring of 1928.

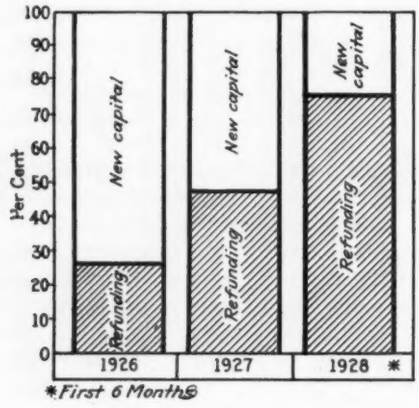


Refinancing operations took bulk of first half year's capital needs

A trend in this direction, if such exists, is facilitated by the recent passage of the Wales law legalizing utility preferred stocks, notes and debentures for certain classes of investment. By its terms life insurance companies, formerly restricted to real estate mortgages, corporation mortgage bonds and various government obligations, may now invest in preferred and guaranteed stocks whose

earning record meets with conditions laid down in the law. Many preferred stocks and debentures of electric light and power companies—both holding and operating —are thus legalized. This ultimately makes it possible for the utilities to obtain funds, through unsecured obligations and preferred stocks, at a lower yield than formerly.

Another factor in the situation is the steady increase in resort to the use of rights and the continued growth



Refunding in power and light industry reached peak during 1928

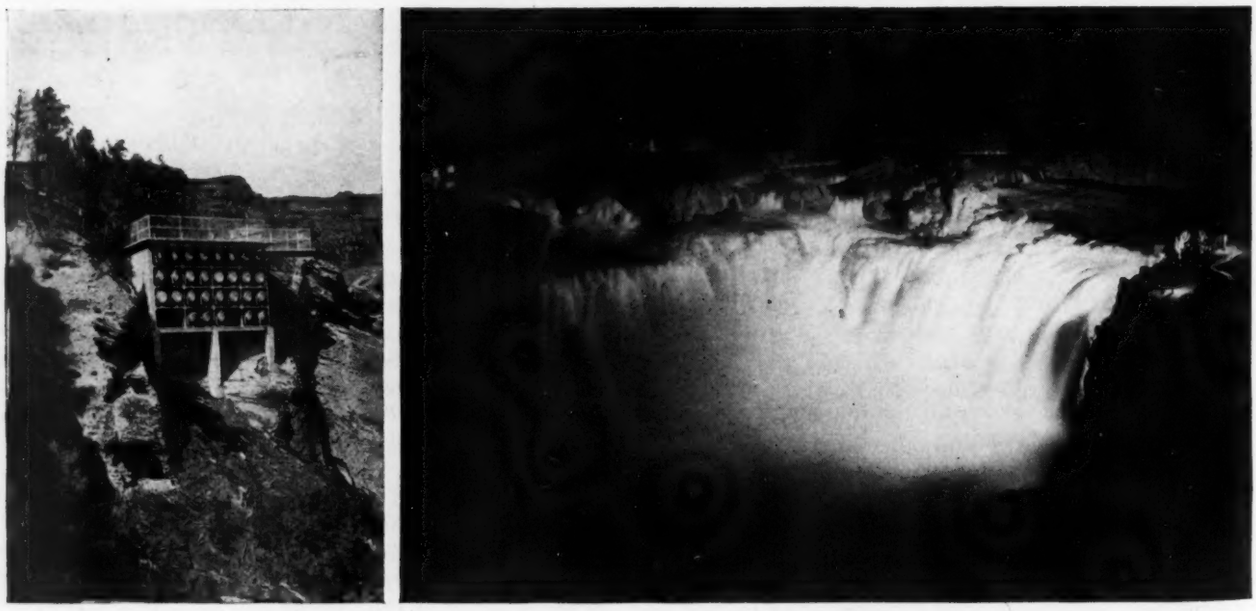
in the number of customer owners. The issue of rights this year to date is in the neighborhod of $120,000,000, and for the first six months of the year it constituted 13 per cent of all financing. While new offerings of bonds by all industries during July totaled less than $200,000,000, stock issues aggregated more than $432,000,000, bringing the total for all financing well over that for July, 1926. This reflects the situation in the power and light industry where July's financing of $32,622,000, an unusually small total for a thirty-day period, showed only $4,345,000 of bond and note financing, many issues having been withheld to remedy market congestion. Among the unsecured obligations recently marketed two are outstanding, a forty-three-million-dollar Public Service Corporation of New Jersey issue of 4½ per cent debentures and a sixty-three-million-dollar debenture issue bearing the same coupon sold by Associated Gas & Electric Company. The former was for the purpose of retiring two mortgage bond issues, a 5½ and a 6 per cent issue. This is convertible into common stock. The Associated Gas issue was also offered to stockholders and its purpose was the retirement of higher-priced issues.

While 4 per cent coupons are predicted in high-grade bond financing for the near future, it seems probable that the type of financing referred to, and also preferred-stock financing, will appear in larger volume in the near future.

Improving Current Transformer Regulation

IN CONNECTION with the merger of a smaller power company with a larger system a constant-current transformer serving a community of considerable population was found to be in use with the whole primary winding included, the secondary winding being on the 80 per cent load tap. The arrangement had given too high a current for the required lamp load and in order to reduce this current to the proper value a number of reactors commonly used in old multiple-arc lamps had been placed in circuit. The constant-current transformer is inherently of low power factor and the addition of reactors to the secondary circuit did not improve it. By simply changing the tap to include the whole of the secondary winding the current through the lamps was brought down to the desired value and the regulation much improved.

Floodlighting of Shoshone Falls a Spectacular Sight



A magnificent and most impressive sight is that presented by Shoshone Falls on the Snake River in Idaho, recently floodlighted by the Idaho Power Company in a spirit of state pride. Illumination is furnished by a battery of 30 floodlights of 1,000 watts each.

Research and Advisory Engineering

An Aid to Sales Promotion

How the power company can act as engineering consultant for industrial customers. Assistance in emergencies and development of new processes pave the way for additional power loads

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THIS is the age of service. No word in the English language stands out in the relations of men in their business dealings with one another as does that one word, service. Those persons, firms or corporations who do not include with their sales the elements of service, which involve prompt deliveries, courteous treatment, guarantees lived up to with great good will and liberal ideas designed to assist the customer to receive the most for his money, cannot last long in this age of keen competition.

This is particularly true in connection with the furnishing of electricity for light, power and heat by a public utility. Electricity is a mysterious thing to most persons, and managers of large industries are no exceptions. Many factory managers who understand mechanical and chemical production processes are lost when questions involving electricity arise.

It is sometimes surprising how little many factory electricians understand about the economics of supply and use of electricity as applied to the plants of which they have charge. This refers particularly to the choice of rates, effects of power factor, control of maximum billing demand, types and sizes of motors and similar considerations. Most factory electricians understand wiring and electrical installation but are not keen on questions of power economics.

For this reason it is essential that the central-station company be ready to serve its customers in an advisory capacity at all times. By offering such service, based on a broad and liberal policy, the public utility is enabled to increase its sales very considerably. Service of this kind cannot be offered in a simple and direct manner without previous preparation. If it is, the customer at once becomes suspicious of an attempt by the power company to pry into his private business. To become most effective the public utility must first build up public confidence and respect—confidence that the utility desires to furnish (and does furnish) good service at the lowest possible rates, and respect based upon the customers' belief that the power company's representatives "know their stuff."

SERVICE AND PUBLIC RELATIONS

The question of building up public confidence involves the whole question of public relations. Some public utilities appear to believe that good public relations can be built up by newspaper advertising, but advertising without performance is useless. Good service and fair treatment of the public do not demand any effort on the part of the utility to acclaim the fact by the use of printers' ink. It is desirable to use printed matter to instruct and educate the public as to the free service, advice and information offered by the power company in lighting and power problems, but it is unnecessary figuratively to paint the lily.

In order to make clear what is meant by public or customers' confidence and advisory service, a few examples may be given to show the effect on sales of gaining the good will of the customer and being able to advise him on matters pertaining to his own affairs.

In one case it was suggested by a power salesman, when making an informal call upon a factory customer, that the customer investigate the possibility of using electric furnaces in his heat-treating department. The customer said he would have his engineers investigate. Nothing more was heard from him for several months and then as out of a clear sky he announced that he was about to build a new factory and would electrify his heat-treating department. He indicated that the suggestion of the central-station's power salesman, made months before, had started him thinking along this line. During the period of purchase of new apparatus he considered gas and oil for his furnaces but continually called in the electric power salesman for discussion and advice and finally completely equipped his heat-treating department with electric furnaces. At the customer's request the power salesman assisted him in laying out his complete electrical installation at no cost to the customer for engineering services.

POWER COMPANY ACTS AS CONSULTANT

When necessary, other departments of the public utility were called in for advice to the end that the customer received the assistance of specialists in every line, and all without expense to him. When it is recorded that this customer installed 1,000 kw. connected load of electric furnaces, cyanide pots and japanning ovens, it will be seen that the power company's engineering service was not in vain. The management of the factory continues to call upon the power company for assistance in various production problems and offers every opportunity to electrify operations that can be effectively and efficiently done by electricity. Some of these problems require not only ideas and advice but research work. The public utility's research laboratory and facilities are freely offered to the solution of these problems. It can therefore be plainly seen that, by virtue of its engineering and research service, the power company is placed in a

position to advance its sales of power, heat and light to no small degree.

Another case is on record in which a power company's sales engineers co-operated with other engineers to develop a new process of butt-welding the two halves of automobile rear axle housings. Needless to say, the energy consumption by this installation was very large, inasmuch as the job required about 3,000 kw.

In another case a power company co-operated with a steel castings plant to develop the electric melting of steel. This was in the early days of electric steel melting, when considerable experimental work had to be done to make the operation successful in a given plant. The sales of electricity that have grown out of the power company's engineering assistance in this case again have been very large.

In another factory it was decided to purchase and install a fuel-fired annealing furnace. Just as the order was about to be signed the facts came to the attention of a power sales engineer. On account of the fair treatment the power company had always given this customer, it was little effort for the power engineer to prevail upon the factory executives to make some tests on an electric furnace already installed in their plant to determine its efficiency and to work out methods of improving it. After two or three weeks' experiments under the direction of the power engineer the factory decided to put in another electric furnace. The power engineer had turned defeat into victory and simultaneously saved the old electric furnace and added another 500-kw. 24-hour load to the lines.

In another case a power engineer prevailed upon a japanning works to put in electric conveyor ovens and advised on their design and operation to the end that the installation is highly satisfactory. The owners of the ovens have recently made the statement that they owe a debt of gratitude to the power engineer for insisting that they would benefit by installing electric ovens. This one example of advisory engineering not only resulted in the sale of a large amount of electrical energy but instigated the installation of other japanning ovens upon the recommendations of the owners of this one.

Consumers Should Look to the Utility for Engineering Advice

Where public utilities have the confidence and good will of the large power users, the latter will usually not install power machinery of any kind without first consulting the power company's engineers. This was demonstrated in one case in which the plant engineer of a paper mill advised the curtailment of purchased energy, but the mill executives would not take steps to do so until they had a report from the power company's engineer. They offered every possible assistance to the power engineer to determine definitely whether or not they could more conomically continue to use central-station service.

Sometimes a utility company's engineering tests and advice appear to work against the utility's interest. A wood-working plant called on a power company for information as to the cost of electrifying its plant and the cost of power after the plant was electrified. The wood mill had a steam engine that appeared to be too small to pull the load required, and the owners were confronted with the necessity of replacing this engine with a new and larger one. In making his investigation the power company's sales engineer took indicator cards on the engine. The indicator cards showed that the valves of the engine were improperly set. The attention of the owners was called to this. They called in the engine builders and had the engine repaired and thus eliminated the necessity of electrifying. The utility lost the opportunity to take on the power load, but in the long run the fact that an honest engineering report was given the prospective customer will react to the benefit of the utility in unlooked-for places.

In numerous other ways a utility can render engineering and advisory service to its customers. Some of this effort results in reduction of bills, but the good will generated by virtue of the broad policy reacts eventually to the benefit of the utility. It also eliminates group rate complaints and political attacks on the power company.

Some of these additional ways of furnishing service are as follows:

Record Meters.—The utility loans or rents meters to customers to measure the load on particular machines or other current-consuming devices. These may be recording or curve-drawing meters, installed for a period of time, or indicating meters used for specific tests. Usually the advice of an engineer, selecting the best ways to apply the meters and analyzing the data obtained, is helpful to the customer. The information obtained is usually also helpful to the utility itself.

Transformer Loans and Emergency Service.—Large customers that own their transformer stations sometimes lose a transformer by burnout. A utility should always stand ready to supply spare transformers in such cases. It has been found that a few 100-kva. single-phase transformers held available for this service will suffice and still not throw a burden on the power company. Operating and maintenance men must also be available at all hours of the day and night, so that the customer may receive immediate service when he suffers from transformer blow-ups. Such service aids in selling power inasmuch as reliability and continuity of service have much to do with power sales.

Similarly, readiness to give emergency service sometimes helps to sell a customer permanent service. Many customers find out for themselves the value of central-station power supply by the use of this class of service, and a broad policy and a spirit of assistance to the customer in such cases often result in sales of large blocks of power.

Power Factor.—The importance of power factor has come to the front very fast in the last few years. Few power users understand the benefits of high power factor or how to correct for it. Some central stations give bill discounts for improved power factor. It is the central station's duty to instruct and assist the customer in power-factor improvement. A proper rate involving power factor will take into consideration a benefit to the utility at the same time it benefits the customer. Advice from the utility's engineers as to the installation of synchronous motors, selection of the proper sizes of induction motors and similar corrective means is always appreciated by the customer. Sometimes the installation of an electric furnace is brought about by the fact that it usually improves power factor. Savings in transformer capacity and copper due to the maintenance of a high power factor sometimes releases money to purchase additional electrical power-consuming equipment.

Best Rates.—Many power companies have optional rates, some of which are better than others for a customer, depending usually upon his load factor or his on-peak demand. A utility should carefully follow up its customers and see that they are advised of the best rate for their conditions. Although few direct sales can

be traced to cases where customers' bills have been reduced by transfer to better rate classifications, still this service assists materially in bolstering up good will. In some cases where customers' bills have been reduced in this way the customers have immediately increased them again by purchase of additional energy-consuming apparatus, or by more liberal use of their present apparatus. Where these optional rate schedules are in force, utilities should have a definite system of following up customers' accounts so that they may be kept on the best schedules so far as the rules permit.

Choice of Best Lamps and Illumination.—Most utilities now assist their customers in choice of best lamps and illumination. This service should extend to both commercial and residence customers. Often a contact made in advising a residence customer regarding best arrangement of lamps or fixtures can be turned to account in electric range or other heating device sales. Similarly, contacts made in advising factories or stores regarding their lighting problems result in sales of industrial heating applications such as heat-treating furnaces, type metal melting pots, glue pots, bake ovens and similar devices.

Municipal and Other Public Service.—A common field for developing load by advisory service is in municipal work. Assistance to the engineering departments of cities in selecting the best types and sizes of motors and control apparatus for water and sewage pumping is always welcome and usually results in large sales of energy. Advice on the latest and best types and sizes of lamps and fixtures for street lighting results in increases in the use of this class of service.

Purchasing Department Investigations.—Most large utilities conduct searching investigations into the quality of materials purchased. Records from operating departments and special tests are used for this purpose. Sometimes information so gained can be made available for a customer without loss to the utility itself. The free dispensation of such information creates a fixed feeling of good will which materially helps in future sales. Occasions arise in which the utility company's research department can advisedly make special investigations for a customer. For example, metallurgical analysis and advice as to best methods of heat-treating steel can often result in sales of electric furnaces.

Library.—A well-stocked and up-to-date library is a very valuable adjunct in assisting customers in their problems. Such a library should contain volumes pertaining to all kinds of work to which electricity may be applied, as well as current trade magazines pertaining not only to the electrical business but to many manufacturing and commercial businesses such as steel, iron and brass foundries, baking and refrigeration, pulp and paper making, textile industries, wood working and other fields of industrial activity.

An example of the value of a good library was recently demonstrated when a customer asked for information regarding the manufacture of a common commercial chemical. This was a new industry for this particular utility, but by reference to the library books were produced that enabled the customer to inform himself very completely upon this subject. The investigation has not been completed, but it is probable that the manufacture of the chemical will be undertaken and large blocks of purchased power will be used.

Almost numberless other examples can be given to show how advisory and research engineering can be offered to customers to increase energy sales. It is not always possible to trace results directly, but every utility company that includes this service in its policy finds that it pays handsomely.

Some of the smaller utilities might find it difficult to furnish advisory service and almost impossible to furnish research service. This can be accomplished through the agencies of the N.E.L.A. committees, through assistance from larger utilities, assistance from manufacturers of electrical applications and employment of private consulting engineers.

Success of Plan Depends Upon Competent Utility Engineers

Personnel.—It is hardly necessary to say that the dispensation of reliable advisory and research service requires the availability of competent engineers to perform it. Not only are good engineers required but the organization must be such that these engineers may work under a liberal policy in order best to help the customer. Many types of organizations can be found to carry out this policy effectively, depending somewhat upon the size of the company.

The following plan is offered simply as a suggestion as to how it might be done. Doubtless some utilities are carrying out an organization of substantially such a character.

In the first place, primarily, all business with the customer should be carried out through the commercial or sales department. If it becomes necessary to call in other departments, the call should be made by the sales department. The sales department should be headed by the commercial manager, assisted by a chief lighting engineer and a chief power engineer. Under these engineers should be as many lighting salesmen and power salesmen as needed.

The power salesmen should be mature, experienced men, particularly qualified for this class of work. It would be impossible for any one man to know all about every industry with which he might come into contact; therefore it is desirable to have men of varied experience whose work can be divided in accordance with their experience, or who can help one another when the necessity arises. For example, one man might be a refrigeration specialist, one might be a specialist in bake ovens and commercial cooking, one might be a steel, brass and iron foundry specialist, one might concentrate on general factory power, one on electric heat-treating furnaces and japan porcelain enameling ovens, and one on routine contracts.

In small utilities it becomes necessary for one or two men to handle all kinds of requirements, and in such cases a man's experience must be versatile indeed. However, so many utilities are now operated by holding or management companies that there are few that cannot afford to have at least one high-class able power sales engineer.

Power sales engineers who perform advisory service leading up to sales can hardly work on any basis but straight salary. Manifestly they must be men of caliber and responsibility. Also, they should be allowed reasonable expense accounts.

Any utility that carries out the practice and policies laid down herein will find itself enjoying great public confidence and increased energy sales without extreme sales effort. Such a utility will become an aid and confidant of its customers to such an extent that its customers will always ask it for advice and assistance in their power and production problems.

A New Idea in O

By A. L. POWELL and R. S. BURNAP
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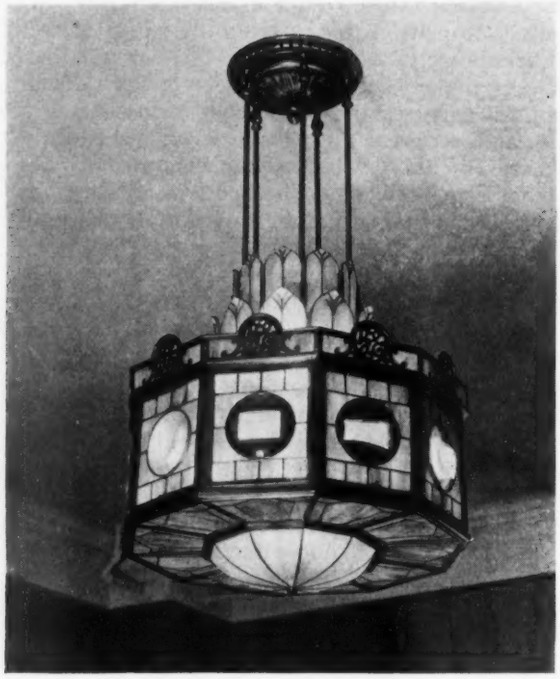


Close-up view of completed fixture with spot lamps lighted to show arrangement of shields or baffles behind lenses

DURING the absence of the sales manager of one of the large electrical manufacturers on a European trip it was decided to remodel and refurnish his private office. The problem of providing suitable lighting equipment was placed in the hands of the writers and it presented an excellent opportunity for demonstrating the effective use of light in an executive office.

Unfortunately, in most cases, lighting fixtures in the private office are considered only from the practical viewpoint of providing sufficient light for clear and comfortable vision. A moment's thought makes clear that this solution neglects the decorative possibilities and the attention-directing power of light. Naturally, the equipment must be harmonious with the decorations and furniture in the office, but the good lighting installation in proper setting is capable of effects which add much to the value of the equipment.

A knowledge of light control and utilization should so extend the application of light that its usefulness is placed within the control of the business man. He should be able from his desk to vary the level of illumination in the room at will. He should be able to call an object to a visitor's attention by lighting it to a higher level. These features have been obtained in a novel and unique manner, from a fixture of original design which is most attractive, cold or lighted. The various details of the equipment finally evolved are shown in the accompanying illustrations.

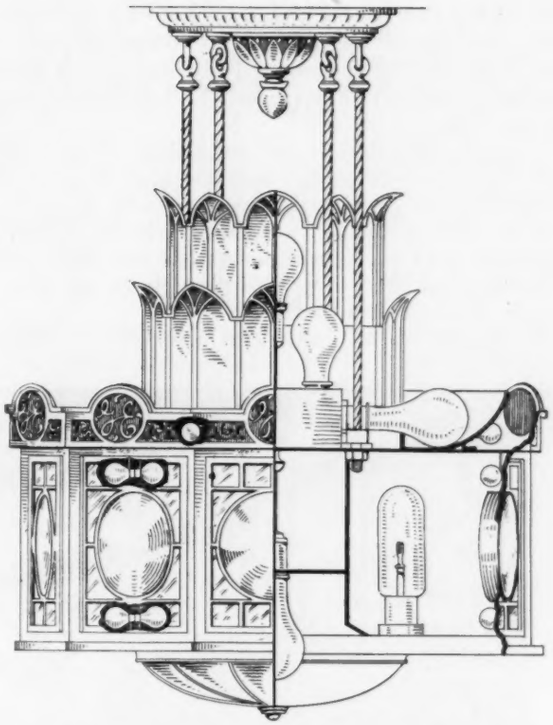
In brief, the entire fixture is modernistic in character, yet not extreme in design. The main part of the fixture consists of a ten-sided framework which carries panels of amber-toned art glass. Centered in each panel is a 5-in. spotlight lens, five of which lenses are utilized for special effects, as described later. The bottom section is also of paneled art glass and is illuminated by a 200-watt ivory sprayed "Mazda" lamp with an opaque cap over the lower end of the bulb to reduce the brightness of the central section. Behind each side panel are placed two blue and two green 10-watt, S-11 bulb, intermediate base "Mazda" lamps, at the bottom and top respectively. Behind the ornamental work, which might be described as the parapet wall above the main housing, are placed ten green lamps of the same type. In the upper, central decorative portion are placed three 25-watt amber-orange and one 50-watt yellow "Mazda" lamps. All this decorative lighting is controlled on one circuit by a three-way switch near the entrance doorway. When turned on there is a beautiful, gradual shading of color—decorative, yet not gaudy. The drawing shows the essential features of the fixture construction and the arrangement of lamps.

On the side of the desk beneath the central drawer is located a small, neat, control box with six miniature flush tumbler switches. These control circuits operate relays located in a nearby closet. One of these switches is of

General view of office as it appears by night under high level, totally indirect lighting

Office Lighting

Specially designed fixture for business office gives unusual flexibility in light control. Attention values and decorative effects obtained



Sketch showing details of metal and glass work and arrangement of component parts

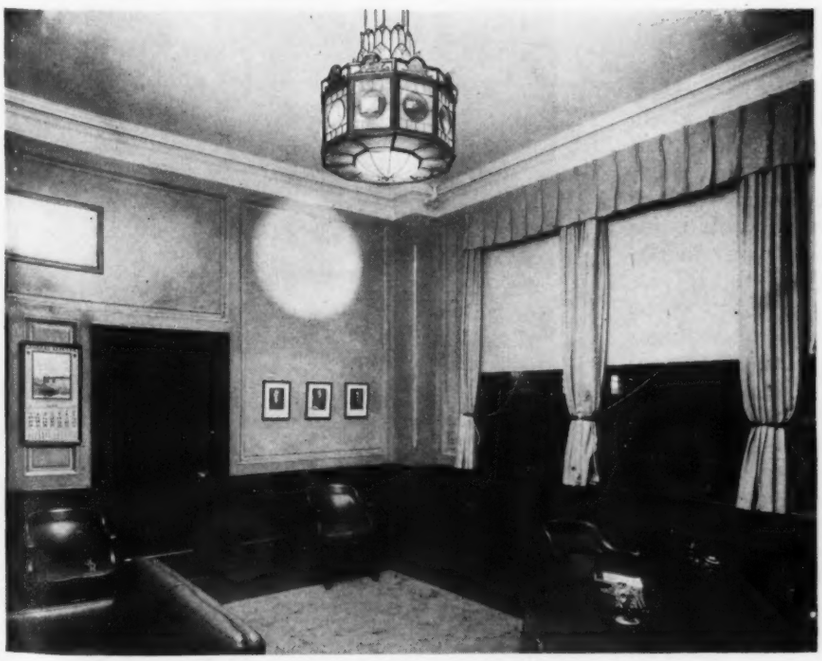
It is of interest to note the circuits for indirect lighting, the lamps for decoration and the concentrated filament lamps and lenses for spotlight effects.

the three-way type for the decorative lighting circuit. A second controls 300 watts of the indirect lighting, and the third 700 watts of the indirect lighting. The other three switches operate spotlight circuits.

The interior of the fixture proper is divided by baffles into various compartments, where concentrated filament "Mazda" lamps with prefocused sockets are placed behind five of the spotlight lenses mentioned above. Three of the spots on one circuit are so directed as to illuminate uniformly a long space above the mantle which is to be filled by a mural depicting the history and development of electric lighting. The art work is not yet completed, but a very interesting effect is produced with the light directed as described. Two other sections are used to direct spots on particular places on the wall opposite the windows which are to be occupied by pictures or charts. Spots are diaphragmed to cover the required area.

With an arrangement such as this, the executive at his desk, and without effort, can vary the wattage used for general lighting from 300 to 700 or 1,000 watts at will, producing respectively 4, 8 and 12 foot-candles on his desk. Suppose a visitor is discussing the business, a touch of a switch at a certain point in the discussion shoots a beam of light from an invisible source to bring a chart showing the state of the business very forcibly to the visitor's attention. Another switch is manipulated and the latest advertisement appears under comparatively brilliant illumination (35 foot-candles) against the relatively darker background.

We believe that this lighting unit illustrates some very useful lighting principles and hope that it will serve as an example for other installations where similar requirements for flexible lighting exist.



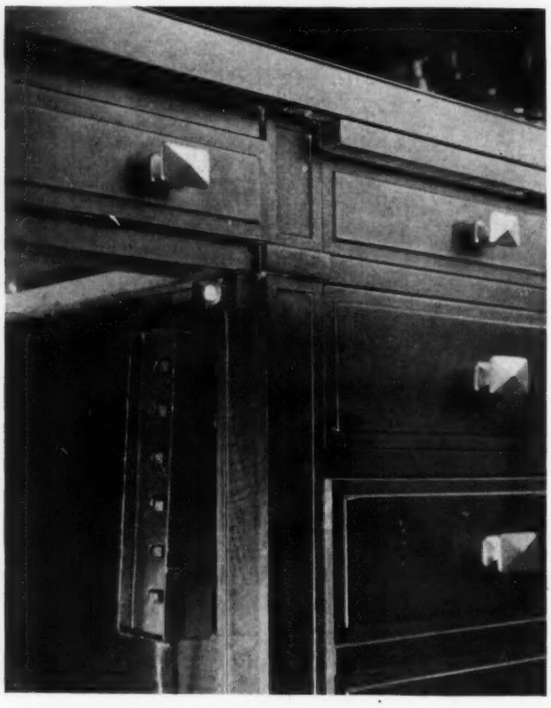
General view showing the indirect spotlight and decorative circuits in use

To control light at will is a relatively simple matter. It is much to be regretted that, in spite of our knowledge of the principles involved, so little use is made of this flexibility in actual installations. One can readily visualize numerous interiors where fixtures with spotlights cleverly hidden as component parts of the unit would prove very effective. In many hotel lobbies, club rooms, restaurants, and the like, beautiful paintings are used on the walls, which are often located in relatively dark corners and never seen to advantage. Sometimes, of course, special lighting units pendent from the ceiling or suspended from the top of the picture are installed, but at best these are rather conspicuous and not a natural part of the furnishings or decoration of the room. If the lighting fixtures themselves can be used to produce special illumination on these pictures, then

the desired end is obtained in a decidedly rational manner. The installation under consideration demonstrates that it is possible to make a decidedly complex piece of equipment without it appearing unduly cumbersome or incongruous.

It is true that the over-all dimensions of the complete unit are rather large, but a single fixture in a private office, average size, must have size to be in good proportion. The accompanying views certainly indicate that the dimensions are pleasing. As has been mentioned, a rich, dignified effect is secured through the use of a deep bronze finish of the metal work.

In closing it is of interest to note how delicately the



Close-up view of control box mounted under center drawer of desk

company emblem has been introduced into the design, giving a distinctive, yet decidedly conservative, touch. Albert Wahle, designer for Bayley & Sons, 101 Park Avenue, New York City, who constructed the fixture, deserves much credit for the skillful manner in which he combined the various constructional features. It is indeed no simple problem to place so many different elements in a single unit.

Electric Melting of Type Metal*

TYPE metal in general consists of 80 per cent lead and 20 per cent tin. Its applications are in pig casting, flat work casting, scrap melting, line casting and monotype machines. In operation these machines require that the metal be kept at a temperature of about 650 deg. F., so that prompt and ample supplies may be on demand. Pig casting is carried on for monotype and linotype machines, the metal being fed in "pigs" of about 15 lb. weight. Newspapers with a circulation of about 20,000 copies use from 20 to 30 line-casting machines, whereas large papers use many hundreds, each being rated at just under 2 kw. Monotype casting machines are rated at from 2.5 to 3 kw. each. Stereotype metal plays an important part in publishing and in general publishers of newspapers require the following:

Paper Circulation	No. of Stereotype Pots
20,000	One 3-ton
30,000	One 4-ton
40,000	One 5-ton
Very large papers	Many 8 or 9-ton pots

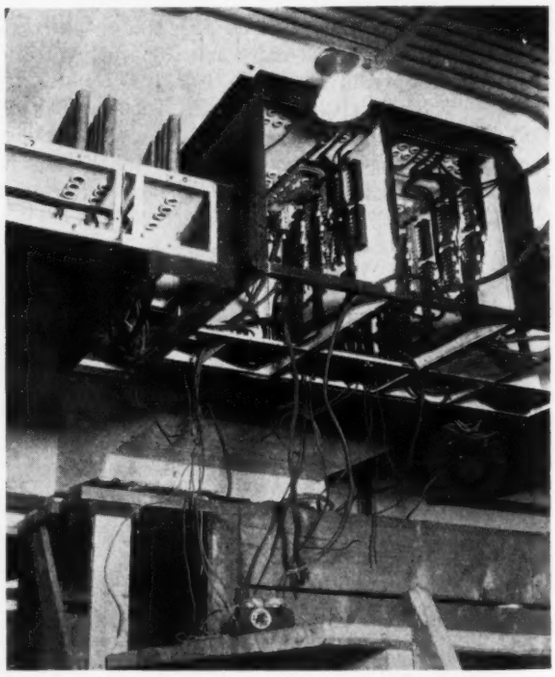
These pots must function properly, as in printing it may be necessary to use even up to 80 per cent of the pot capacity in the last hour before the production of the paper. Pots rate at from 15 to 200 kw. and a survey of the field indicates a potential market in this country of about 1,000 papers needing new stereotype machines.

**From James H. McGraw prize paper by B. M. Riker, industrial heating engineer.*

Providing for Additional Control Wires in Existing Station

IN BUILDING the 90,000-kva. Big Creek No. 2-A plant of the Southern California Edison Company, which adjoins the existing No. 2 plant, it was desired to center the control of both plants at the old switchboard. This necessitated running numerous additional circuits through an existing plant where no provision had previously been made for the necessary conduits and wireways.

The problem was met by installing a metal wire-way



Metal wire-way and terminal cabinet make inexpensive and neat installation for additional control circuits

and metal terminal cabinet as shown in the accompanying illustration. The metal duct and terminal cabinet are mounted on the ceiling directly in front of the new conduits from the No. 2-A plant and below the switchboard in the control room of the old plant with conduits extending through the concrete floor.

Through-the-Dealer Sales

Trade relations are satisfactory, and power company builds load at rapid rate at reasonable cost under special merchandising set-up

SO MUCH interest has attached to the Courtright merchandising plan, now better known as the "through-the-dealer plan" of the Valley Electrical Supply Company, merchandising subsidiary of the San Joaquin Light & Power Corporation, that a representative of the ELECTRICAL WORLD undertook to determine a few salient facts in connection with this method. The plan as evolved by Mr. Courtright, president and manager of the Valley Electrical Supply Company, and officials of the San Joaquin Light & Power Corporation recognizes that a period of pioneering is necessary in the early life of many electrical appliances and that the burden of expense necessary to popularize these appliances quite logically falls upon the power company. In the pioneering and stimulating of this merchandise, sales activity is based on the "through-the-dealer sales plan," a plan that provides practical sales assistance to the dealer so that his merchandising activities may be profitable to him. Through this method of merchandising complete co-operation of all four branches of the industry—namely, the manufacturer, the jobber, the dealer and the central station—are obtained.

The set-up between the Valley Electrical Supply Company and the San Joaquin Light & Power Corporation is predicated upon the theory that the power company can well afford to spend approximately one-third the first year's revenue from certain load-building appliances through the Valley Electrical Supply Company for advertising and promotion to build domestic load at a more rapid rate. Payment is made on the basis of $5.08 per connected kilowatt of ranges, water heaters and heavy-duty appliances and $3.66 per connected kilowatt for those socket appliances only that are campaigned during the year.

USE OF ELECTRICITY IN THE HOME

(Yearly growth on San Joaquin Light & Power Corporation system, brought about largely as the result of intensive merchandising).

Year	No. Domestic	Average Annual Revenue	Average Kw.-Hr. per Customer	Year	No. Domestic	Average Annual Revenue	Average Kw.-Hr. per Customer
1918	21,073	$18.40	256	1923	42,782	$27.50	442
1919	23,399	21.10	273	1924	46,141	27.90	463
1920	26,610	23.60	302	1925	48,834	28.90	490
1921	32,151	26.10	340	1926	52,384	31.00	550
1922	37,706	26.50	374	1927	56,971	33.60	642

To stimulate dealers all range sales are placed through them excepting in the cities of Fresno and Bakersfield, where the Valley Electrical Supply Company maintains retail stores. In these as well as all cities and towns on the system the Valley Electrical Supply Company's salesmen assist the dealer in making sales of ranges, water heaters and heavy-duty appliances or make sales and place them through dealers in the immediate territory where the sale is made. This service is given to all dealers who co-operate with the power company and its merchandising subsidiary in their sales program. The power company pays the Valley Electrical Supply Company for all such sales at the rate of $5.08 per kilowatt connected, and the dealer makes the merchandising profit on the sale and handles all details, including time payments, directly with the purchaser. Eighty-six dealers, embracing both electrical and non-electrical, are tied in with the range sales program.

The plan on lamp-socket campaign specials is to turn over to the 96 co-operating dealers as many of the appliance specials as they estimate they will be able to sell during the period of the campaign and bill them for these at practically the cost to the Valley Electrical Supply Company. The latter pays for all advertising and broadsides and lists the names of all co-operating dealers in local newspaper advertising. Dealers are encouraged to use the specials only as leaders to stimulate the sale of similar standard nationally advertised appliances, and experience has shown that for every ten specials sold eight standard appliances carrying a 40 per cent margin are sold. For such load building the Valley Electrical Supply Company receives $3.66 per kilowatt connected from the power company and the dealer makes a merchandising profit of approximately 30 per cent.

INVESTIGATION OF PLAN

The essentials of any central-station merchandising plan are these: First, it must build load for the power company; second, it should promote good dealer and public relations and should be designed to build up the dealer; third, it should be conducted with due regard for the jobber and the manufacturer. Does the Courtright plan satisfy the terms of this simultaneous equation? Proof that it does build load for the power company is shown by the fact that during 1927 through the efforts of the Valley Electrical Supply Company the connected load of the fifty-six thousand odd domestic customers of the power company was increased by 23,322 kw., which was equivalent to merchandise sales of $31.15 per customer. As further proof that the plan has built load for the power company is the fact that average domestic consumption has been increased from 256 kw.-hr. per customer in 1918 to 642 kw.-hr. per customer per year in 1927. Figures for the past ten years are given in the accompanying table.

What is the attitude of dealers toward the plan? Almost without exception every dealer, electrical and non-electrical, in the 600 square miles served by the power company whole-heartedly indorses the "through-the-dealer plan." A recent field survey made by a representative of *Electrical Merchandising* proved this to be a fact.

Does the plan include the jobber and the manufacturer in the picture? All merchandise sold, including campaign specials, passes through legitimate jobbing channels, resulting in increased business for the jobber and manu-

facturer because of the greater volume of business done by dealers as a result of tying in with the "through-the-dealer plan." Under the plan Mr. Courtright has 106 active dealers selling appliances who admit that their volume of business has been greatly increased as a result of the large amount of money spent by the power company's merchandising department for advertising, demonstration and promotion. The attitude of the jobber is indicated by a resolution passed at a recent meeting of California jobbers indorsing the plan.

Cost to Power Company

If the foregoing statements be accepted as fact, the obvious question is, how much is it costing the power company to have this kind of a job done for it? The cost to the power company of building load under any sales plan is only relative, because it depends upon what the power company is receiving for its money. "It is just like the insurance business," stated Mr. Courtright; "you pay for what you get and you get only what you pay for. Insurance premiums are all figured out on a mathematical and scientific basis; you pay a little more for this or that added feature. If you are satisfied with less protection, your premiums are less, and so it is with power-company merchandising. If you want a real job which builds load at a rapid rate, builds up the dealer and promotes good trade relations, it may cost a little more than half-way measures, so it is a case of compromise between what you want and what you are willing to spend."

During 1927 the Valley Electrical Supply Company did a gross merchandising business of $600,000 and added 12,322 kw. of connected cooking and water-heating load, for which it received from the power company, at $5.08 per kilowatt, $62,595. It added 6,325 kw. of appliance load, for which it received, at $3.06 per kilowatt, $23,-149, or a total from the power company of $85,744. Besides this it added approximately 5,000 kw. of appliance load, including refrigerators, washing machines, standard appliances, etc., for which it received nothing from the power company. After paying all expenses, including the highest rent per square foot paid by any retail store in the city of Fresno, it showed a net profit at the end of the year which was returned to the power company. For the 23,647 kw. of new business added the power company spent less than one-third the first year's revenue, and on this basis the sales manager and officials of the company consider it good business.

Moreover, under the "through-the-dealer plan" the power company not only is building load at a rapid rate with satisfactory trade relations, but through intensive advertising, demonstrations and follow-up and by concentrating on the rural customer it is receiving a higher rate of return per kilowatt connected than any other Pasific Coast power company. Range and water-heating business is bringing the San Joaquin Light & Power Corporation $12.50 per kilowatt connected per year as against an average of about $7.50 for other Pacific Coast power companies. If efforts of the Valley Electrical Supply Company had been directed primarily to cities and towns, it would have been possible to reduce mileage and sales expense considerably, but the return to the power company per kilowatt of business would have been less also because the farmer's wife does not have the same opportunity to buy bakery goods and ready prepared foods that the woman in the city has, and hence she must use her range more.

To do a gross business of $600,000 the Valley Electrical Supply Company spent between 8 and 9 per cent for advertising and on county fair exhibits as against not more than an average of 2 per cent spent for advertising by other power companies. As a result of this intensive advertising, however, all dealers were greatly benefited by the large amount of money spent in stimulating appliance business.

If advertising had been held to 2 per cent of gross instead of 8 per cent, $36,000 could have been saved, or approximately one-half of the amount paid by the power company. In many other ways expenses could have been cut. By concentrating on appliances having a large margin of profit without regard to their load-building value and by ignoring the dealer, Mr. Courtright contends that he could have shown a nice net profit without the financial assistance of the power company; but the power company would not have had the job done for it which its financial assistance made possible, "and it comes back again to getting just what you pay for" stated Mr. Courtright.

Benefits of Plan

Summing up, then, the net benefits which accrue to the power company under the "through-the-dealer plan" are: The power company is building its domestic load at a rapid and satisfactory rate; the amount of money spent to obtain the business is no more than is spent to obtain other classes of business, and all of the money advanced to its merchandising subsidiary is spent to give a service not otherwise possible; the power company is receiving a high rate of return per kilowatt of connected load and through the activities of the Valley Electrical Supply Company is constantly building better public relations, thereby saving money that otherwise might be spent on purely public relations work; dealers like the plan and are increasing their business at the rate of 20 per cent a year, a pace which they can stand; jobbers and manufacturers are receiving a greater volume of business than they otherwise would by reason of the intensive selling effort put forth by the Valley Electrical Supply Company and its chain-store dealers. In short, it may be said that the power company is receiving benefits, at what it considers a reasonable price, which few other power companies are enjoying.

Red Seal Homes Prove Value as Energy Users

ENERGY consumption comparisons for Red Seal homes and those not so wired indicate definitely the utilization value of the properly wired house. The following figures were compiled by B. Badrian of the Society for Electrical Development:

In Minneapolis—Comparison of 100 houses, of same size:
100 non-Red Seal—no range—39 kw.-hr. monthly average
100 Red Seal—no range—104 kw.-hr. monthly average.
100 Red Seal—with range—235 kw.-hr. monthly average.

In Toronto, where Red Seal started—In 1926 E. M. Ashworth, managing director Toronto-Hydro-Electric System, had figures prepared on the load which showed that 633 Red Seal houses with ranges used 174,585 kw.-hr. per month, compared with 58,018 kw.-hr. for 633 non-Red Seal houses of the same size. This is three times as much, and Mr. Austen, of the Toronto Electrical League, says that in 1927 it was nearer four times as much.

In Syracuse, N. Y.—Nineteen Red Seal homes showed an annual central station average per home, annual income of $39.60, against nineteen non-Red Seal homes with central station annual income averaging $25.50 per home.

In Hudson Valley—Eighteen Red Seal homes showed 61 per cent increase in kilowatt hour above average non-Red Seal home.

In Buffalo, N. Y.:

	Average Kw.-Hr. Per Month
35 Red Seal homes, with ranges	253½
29 Red Seal homes, no ranges	142
21 non-Red Seal, with ranges	225
43 non-Red Seal, no ranges	111

In Oakland, Cal.—Fifty Red Seal homes had an average monthly consumption of 516 kw.-hr. per home.

On the Pacific Coast—A survey covering the territory of the California Electrical League on the Pacific Coast showed a general average of 435 kw.-hr. per year per residence. A survey of 100 Red Seal homes in the same territory showed an average of 429 kw.-hr. per home per month, virtually twelve times the general average.

Niagara Frontier:

	Kw.-Hr.
64 Red Seal homes, average monthly	203
64 non-Red Seal, average monthly	148.6

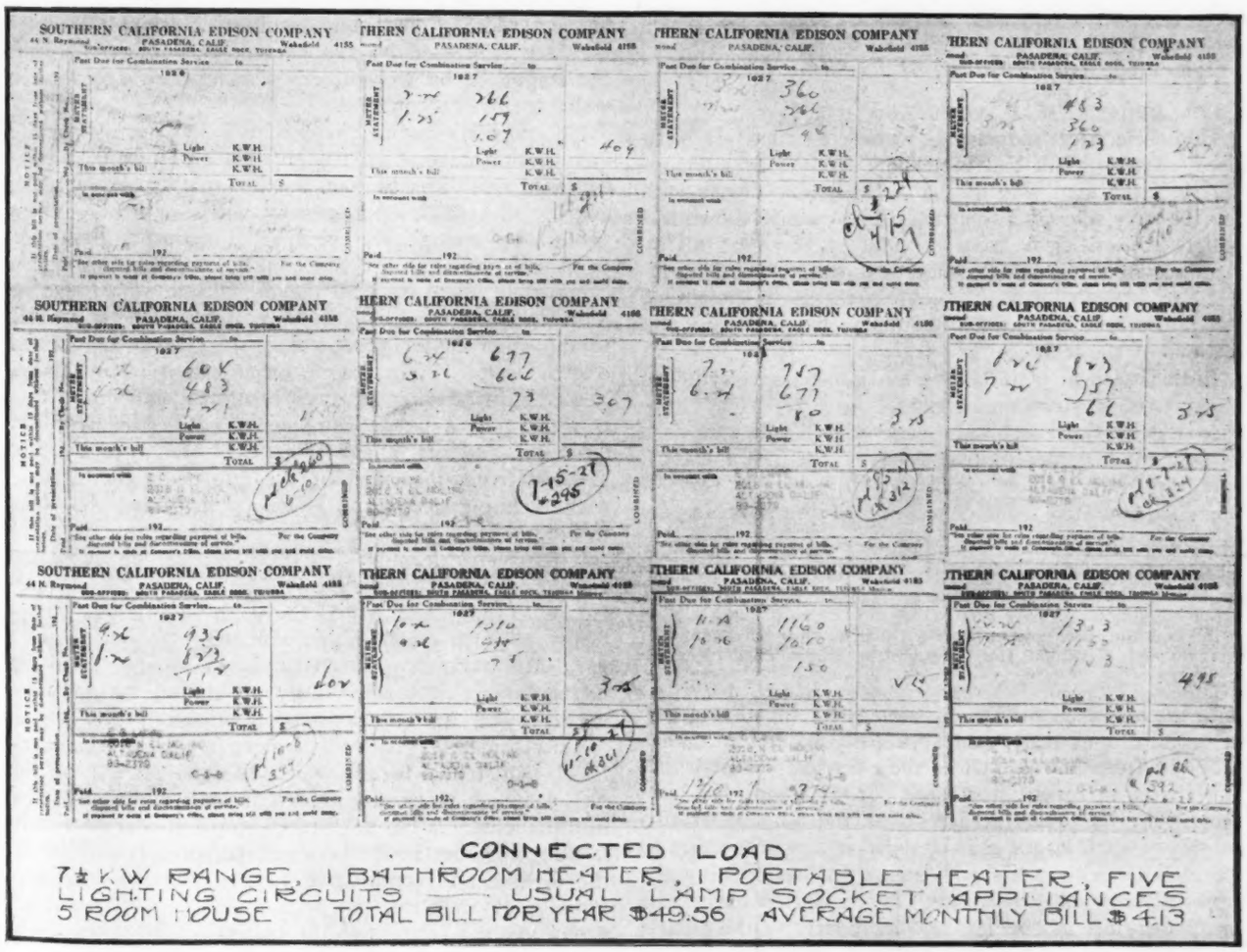
In presenting the figures given above at a recent meeting of the Maryland Utilities Association, N. H. Barnes of the Potomac Electric Power Company pointed out that it requires about a year's occupancy of a house to determine what the current consumption is apt to be. In Washington the Red Seal plan has only been in full operation about ten months, said Mr. Barnes. All of the Red Seal houses were under construction, or just being planned, when applications were secured, and therefore none of them has been occupied much over six months. Among the first to be occupied, however, a study of 21 proves interesting. These houses can be divided into the following divisions:

	Selling at About	
Row houses in southeast sections	$7,000	3
Row houses in northeast sections	8,000	4
Row houses in northwest sections	12,000	8
	Costing About	
Detached houses in various sections	15,000	6

During a period of six months, from July to January, the monthly average kilowatt-hour consumption for these 21 houses was 71.23 kw.-hr. The general residence average in Washington is about 42 kw.-hr. per month.

Customer's Bills Reproduced to Aid Salesmen

THE psychological effect of being able to show a prospective purchaser of an electric range or other household appliance a typical customer's actual bills for twelve months for similar service has led the merchandising department of the Southern California Edison Company to prepare a number of photographs similar to the one illustrated. All members of the company's sales force as well as contractor-dealers in the territory are furnished with these sales helps.


SOUTHERN CALIFORNIA EDISON COMPANY
PASADENA, CALIF.
CONNECTED LOAD
7½ K.W RANGE, 1 BATHROOM HEATER, 1 PORTABLE HEATER, FIVE LIGHTING CIRCUITS — USUAL LAMP SOCKET APPLIANCES
5 ROOM HOUSE TOTAL BILL FOR YEAR $49.56 AVERAGE MONTHLY BILL $4.13

Photographic reproduction of a typical domestic customer's bills

Employees Aid in Range Sales

AN INTENSIVE range-selling activity conducted during the months of June and July by the Utah Power & Light Company resulted in the sale of 765 electric ranges among the company's 80,000-odd domestic customers, approximately 14,000 of whom were already users of electric ranges. In addition to the usual methods using liberal display advertising, billboards and various other media, to stimulate interest in this drive a special inducement was offered to all employees of the company to hand in prospects for regular salesmen to work on. Five dollars in cash was offered for each prospect that was received through this source which resulted in a sale. Many individual employees added materially to the amount of their monthly pay check in this manner.

As an incentive to the regular salesmen prizes of a Hotpoint electric range, a Westinghouse electric range, a Radiola and a Stanley lunch set were awarded after the campaign to the salesmen holding winning numbers. Each time a sale was made the salesman was given a number. At the end of July, with a total of 765 numbers in the box, twenty were drawn out, and each fifth number drawn won one of the prizes in order named. This feature created much interest and enthusiasm.

Letters from Our Readers

Effective Functioning of Electric Leagues

To the Editor of the ELECTRICAL WORLD:

If the electrical industry is to be constructively criticised, that criticism had best come from within the industry, from men who have had direct experience with the industry and its problems. There will be far less destructive criticism from without if straight talking members of the industry voice their candid opinions instead of actively or tacitly joining the great chorus of self-praise that is continually sung in house organs and sections of the technical press.

In this spirit of plain talking and constructive criticism I take issue with your editorial of Aug. 18, "The Problems Before the Electrical Leagues." I will take as a text for my argument quotations from the first and third paragraphs of your editorial, which I believe may be fairly said to state your conception of the possible way to handle the problems.

> Clearly the leagues are waiting for their work. They are looking to the industry for a program, for support and for leadership.
>
> The manufacturers have been active supporters of many leagues in the past and have now in process a plan to clear such contributions through a national fund that will be proportioned to league service.

In the above quotations you describe a spineless group of organizations ready and apparently willing to take a program from any branch of the electrical industry that is prepared to furnish a subsidy. It apparently has been decided by the manufacturers that the amount of this subsidy to each league will be doled out in proportion to the league's willingness and energy in broadcasting the nationally controlled program. If the electric leagues of the country are as hopeless and ineffective as the picture you have painted in this editorial, then small wonder that the electrical industry has been unable to maintain the desired relations with the public and is subject to continued harassment from the press and politicians throughout the country.

For your information I will describe another type of electrical league, not drawn from the imagination, but an actual organization now functioning, to the great benefit of that section of the electrical industry that it represents. In this organization are more than 700 men who are representative of no less than fourteen main groups of the electrical industry or other industries with which it is allied.

In addition to the jobbers, electrical and radio; the contractor dealers, the manufacturers and the public utilities, electric, telephone and telegraph, this organization has represented in its ranks consulting engineers, manufacturers' agents, electric vehicles, street and steam railroads, manufacturers of pumps, towers, water wheels, etc., public utility commissions, fire underwriters, industrial accident commissions, city engineers and city electricians.

While these major industries and agencies are represented by executives, engineers and general employees, their representation is entirely unofficial and the league is purely a social body, organized for the primary purpose of promoting personal acquaintance among the individuals who constitute the electrical industry. This group meets weekly, with an average attendance of 30 per cent of its members, and at such meetings, in addition to a social program, is addressed by a speaker selected by the league's officials.

On many such occasions the subjects are of a cultural and entertaining character, on other occasions the meetings are addressed by members of the industry within the league or by well-informed technicians from other states or foreign countries.

The various groups represented by this composite membership have at least twelve trade or technical associations, which are the tools used to further special plans for the promotion of commercial development. These trade associations have organized bureaus with permanent paid staffs and are best capable of promoting public campaigns which are for the direct interest of one or more special groups, but are only of sympathetic interest to the other major groups that are represented in the electric league. The league organization is invaluable, however, in offering an open forum to each group that is promoting a public campaign, and in this way the electrical and its allied industries are instantly and authoritatively informed of the efforts of each group, with resulting speed and efficiency in giving the story to the public.

This electric league finds itself entirely unadapted as an agency effectively to carry on informational campaigns to the public, and if the truth were known, practically all such amateur and volunteer efforts result in very little more than internal noise and excitement. By maintaining a fine community reputation, as an independent and uncompromised organization, this league has performed an invaluable service in giving to the electrical industry a forum which has the respect of the public, which recognizes that it is both authorative and untrammeled. It has performed a still greater service in knitting together in the bonds of personal friendship all the diverse and competitive factors that are often internally at variance, but which present a harmonious group in their relation to the public.

LOUIS F. LEUREY,
San Francisco, Calif. Consulting Electrical Engineer.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Some Recent Canadian Hydro-Electric Power Plants.—One of the leading features of the industrial development in Canada during recent years has been the large number of hydro-electric power plants that have been constructed. Future plans involve a large number of similar projects and numerous stations are under construction, extension or scheduled for early erection. The features of design and the specifications, as well as the conditions under which the plants must operate, are given for the Chelsea Falls station on the Gatineau River, the Great Falls station on the Winnipeg River and the Bryson station on the Ottawa River. Some of the practices involved in the construction work for these projects have been included.—*Engineer* (*England*), Aug. 10, 1928.

Selection and Purchase of Coal.—A. A. POTTER and H. L. SOLBERG.—The advantages and disadvantages of specification buying have been reviewed by the authors in connection with suggested practices. The purchase of coal under specification has the advantages that all bidders are placed upon a competitive basis, the purchaser is assured of a supply of coal of uniform and known quality, a definite basis is provided for adjustment of the price in accordance with the qualities of fuel, which, if the specifications are properly drawn, is equally fair to both the buyer and the purchaser. Among the serious disadvantages to the purchase of coal by specification are: The cost of the analysis and the difficulty of securing a representative sample; accurate sampling is a laborious process that is generally neglected; the seller has no positive assurance that the small sample, on which the analysis is made and the price adjusted, accurately represents the coal in a shipment of several hundred tons; representatives of the seller are seldom present to watch the sampling process; the purchaser must be trusted to select a fair sample; the seller may quote a higher price for his coal in order to protect himself against penalty; and reliable organizations have a tendency to feel that their business integrity should be trusted rather than assailed through bidding on the specification basis.—*Power*, Aug. 14, 1928.

Generation, Control, Switching and Protection

40,000-Kva. Turbo-Generators for 3,000 R.P.M.—R. POHL.—While ten years ago the output of a turbo-generator was limited to 10,000 kva. for the two-pole type and 20,000 kva. for the four-pole design, the latest experiences in electrical and mechanical designs have made it safely possible to raise these outputs with 3,000 r.p.m. and 1,500 r.p.m., to 50,000 and 100,000 kva. per unit. This article gives detailed information on the modern layout of 40,000-kva., 3,000-r.p.m., three-phase generators, built by a large German concern. A critical comparison is made of two types of stator winding; that is, the half-coil two-layer winding and the rod conductor type. The smaller size, fewer connections, less eddy losses and somewhat easier anchoring are in favor of the former. However, the advantages of the rod winding simplify greatly the replacement of a damaged conductor and the possibility of using closed stator slots constitutes another desirable feature. The rod winding, because of its lower cost, is used almost exclusively for this type of generators. The rotor field is aluminum wound, to reduce weight and forces. Such a field winding weighs only 40 per cent of an equivalent copper field. Special care is required for the connection between the ends of the aluminum winding and the steel collector rings.—*Zeitschrift des Vereines Deutscher Ingenieure*, July 21, 1928.

Economics of Supervisory Control.—R. J. WENSLEY.—A summary and explanation of the various methods used in the remote control of automatic stations. These include direct electric circuits, direct-current impulses, synchronous systems, audio-frequency alternating-current impulses, radio-frequency control, multiple-frequency alternating-current control. The several advantages and disadvantages inherent to each of the systems have been reviewed and the possibilities of other forms of control discussed and the recently developed Televox equipment described.—*Electrical News* (*Canada*), Aug. 15, 1928.

Transmission, Substations and Distribution

The Characteristics of and Tests on the Tokyo Line of the Nihon Electric Power Company.—KENJI KATO and M. TAKAHASHI.—The results of a series of investigations relating to a transmission line and to the characteristics of the synchronous machines connected to it. In addition to the routine tests upon a 154,000 volt, 300 kilometer line, special determinations were made including: the charging of each line against the earth, the measurement of the induced voltage in a neighboring public telephone circuit, and also in the company's communication conductors, measurements of line-to-earth impedances and admittances, line-to-line impedances and admittances, and charging various lengths of the line at three phase normal voltage. The results of these tests have been evaluated in accordance with their relation to theoretical considerations and a full report appended. The line charging characteristics as influenced by the generator connected with the lines, have also been investigated. The question of transmission line stability has also been introduced in this discussion in connection with the short circuit ratio and quick response excitation characteristics of the generators.—*Journal of the Institute of Electrical Engineers of Japan*, July, 1928.

Thermal Resistance of Cables.—A. M. TAYLOR.—An explanation of the greatly improved thermal dissipative capacity claimed for an "intersheath" cable, as compared with a single-core cable, together with other advantages possessed by the former. As the result of his investigation the author concludes that in two cables of almost identical diameter, voltage gradient, and thermal drop the thermal resistance of the single-core cable is nearly twice that of the intersheath cable. The practical considerations which influence the installation of cables have been pointed out with particular reference to the findings of this investigation.—*Electrical Review* (*England*), Aug. 17, 1928.

Units, Measurements and Instruments

Stresses on Testing Transformers.—H. MÜLLER.—An investigation of the voltage stresses on testing transformers, occasioned by the flashover or the puncture of the tested object. According to the author, discharges of the character of sphere spark gaps may cause violent and steep over-voltages, while brush discharges, if they do not lead to an actual flashover, may be called harmless. This applies to single-step as well as to chain-connected high-voltage testing sets. The results reported were first obtained by theoretical conclusions, which were subsequently checked and found correct by actual measurements with gaps, klydonographs and wave character-measuring instruments.—*Elektrotechnische Zeitschrift*, July 5, 1928.

Stroboscopy and the Testing of Rotatory Meters.—G. E. MOORE.—In the opinion of the author there are serious limitations to stroboscopic meter testing, and he has endeavored to point out both the limitations and advantages involved in the application of this method of testing to the calibration of watt-hour meters. Laboratory determinations in connection with the design and construction of the meters of a British manufacturer have been included. The author concludes that stroboscopy as applied to meter testing has claims to spectacular rather than calibration purposes. Under laboratory conditions it is stated that it can prove a useful means for examination of instantaneous effects and for such tests dealing with accuracy change following voltage, temperature

and other specific variations, but for routine work in a meter test shop its utility is seriously limited for reasons given in some detail. The ordinary meter is a slow-speed instrument, and stroboscopic methods were introduced for extra high speeds and observation of rotating objects, such as meter discs involves an inverse arrangement, whereby the actual member under test must give the necessary high mark frequency by a multiciplicity of marks. This is said to affect the principle of the integrity of method. An additional point against instantaneous indication is that a meter is essentially an integrating mechanism, so that true registration of kw.-hr. must remain an important and final practical criterion. The dial run test is even more imperative under the exacting conditions obtaining when installed.—*Electrician* (*England*), August 3, 1928.

Heat Applications and Material Handling

Automatic Constant-Temperature Bath for Asphalt Tests.—C. W. Betz. A test arrangement for the maintenance of a water bath within temperature variations of 0.1 deg. has been devised for laboratory purposes. The system consists of a large double-walled circular tank containing the general water supply in which are placed the thermostat and source of heat. From this tank the water is pumped by separate pipes respectively to the several items of test equipment. The maintenance of effective circulation is an essential feature of this device. Details of the installation and piping arrangements as well as electrical connections have been given. — *Engineering News-Record*, Aug. 16, 1928.

Dodge Electrifies Heat Treatment.—Heat-treating operations on parts used in the manufacture of motor cars by Dodge Brothers, Inc., are with few exceptions performed in electric furnaces. New equipment of various continuous and automatic types includes more than 60 furnaces drawing a total current of 11,400 kw. The reasons both as to economy and quality which influenced the engineers in selecting this equipment are enumerated and the structural details and plant layout are given. Unusual plans have been adopted for the charging facilities and for the removal of material from the furnaces. These have permitted unusual time savings. A plan for the hardening of the connecting rod bolts permits the discharge of material through tubes extending into an oil-quenching tank, thus eliminating all exposure to outside air.—*Iron Age*, Aug. 16, 1928.

Methods of Electric Welding.—The characteristics of the several processes involved in electric welding work dictate the applications to which individual methods of welding may be applied. In this report the important features of the practical use and of the equipment for electric arc welding, resistance welding and atomic hydrogen welding have been considered. The various types of electrically welded joints and the features of the automatic welding head employed for such work, as well as the application to which such processes may be applied, have likewise been included. — *Serial Report National Electric Light Association*, August, 1928.

Electrophysics, Electrochemistry and Batteries

Use of the Noble Metals for Electrical Contacts.—E. F. Kingsbury.—An outline of the behavior of gold, silver and platinum in use as electrical contacts in communication circuits. A careful investigation of the service factors of the several metals and alloys used for contact purposes has been made and among the topics introduced are: Substitutes for platinum, dependence of behavior on form of discharge, importance of mechanical conditions, contact resistance, the various types of erosion occurring both in air and in other gases, relation of current to erosion, transfer of metals in discharges and similar factors.—*Reprint B-298, Bell Telephone Laboratories, Inc.*

Telegraphy, Telephony, Radio and Signals

Correlation of Long-Wave Transatlantic Radio Transmission with Other Factors Affected by Solar Activity.—Clifford N. Anderson. — Phenomena usually thought of as being effected by solar activity are: Sun spots, solar constant, earth's magnetic field, atmospheric electricity, auroras, earth currents and radio transmission. In order to correlate these with each other an analytical investigation of certain experimental readings and data were made. Values determined by previous investigators checked closely with some of the factors involved and new relationships were established. The correlation of disturbances on grounded telegraph lines indicates discrepancies in times of beginning and in times of maximum disturbances in earth currents and earth magnetic field, and the report concludes, as have other investigators, that these phenomena are not related in any way.—*Reprint B-303, Bell Telephone Laboratories, Inc.*

Radio Valve-Anode Capacitive Resistance. — Ernest W. Braendle. — The theory and operation of capacitive resistance in valve-anode and other circuits has for its consideration the fluctuating potential across a fixed resistance when such varying voltages are due to changes of other resistances in the circuit and not to fluctuation of the initial applied potential. The author maintains that the present practice of treating such problems as comparatively simple alternating-current conditions is incorrect when effective capacity is present. Sufficient examples have been given to point out the application of the ideas involved and it is indicated that usual impedance and reactance formulas should not be employed when considering the functions of such circuits and that therefore some new formulas should be evolved to deal with such conditions.—*Electrical Review* (*England*), Aug. 10, 1928.

Some Practical Applications of Quartz Resonators.—G. W. N. Cobbold and A. E. Underdown.—A distinction is drawn in this discussion between the case in which the resonator is used merely to interfere with the oscillations of an electrical circuit and the case in which the resonator is employed as a means of controlling the frequency of such oscillations. Reference is made to the various modes of vibration, to the effects of temperature and to the shapes and dimensions of the resonators commonly used. The methods of cutting and grinding are referred to and the manner in which frequency measurements have been made is described.—*Journal of the Institution of Electrical Engineers* (*England*), August, 1928.

Miscellaneous

Rural Electric Service.—According to this committee report it is probable that no year in history has witnessed such significant developments in the application of electricity to agriculture as the one just closed. The report covers organization of rural electric service departments, makes note of commission orders and rulings during the year 1927, discusses rural line construction standards and the national project for the development of the farm load, points out the educational opportunities involved in energy application for the farm and takes note of probable developments in new uses.—*Committee Report National Electric Light Association*, June, 1928.

Rural Electrification. — Following a six months' investigation of supply problems in rural areas, a special conference convened by the Electricity Commissioners (Great Britain) has just issued its report. The two principal matters considered by the conference were: The nature and extent of the potential demand for electricity in rural areas and the bearing and general effect upon rural development of the price of supply and the cost of electrical equipment. One of the main conclusions is that for economic reasons rural electrification cannot be proceeded with to the extent of offering a supply to every inhabitant, farm and other premises in rural Britain. The report also states that there is little doubt that the prospects in the sparsest and most remote areas are of such a low order as to preclude, or at any rate delay for many years, the establishment of public supply on a remunerative basis. A review of the new code of overhead line regulations is suggested in order to effect further economy. Greater economy in the capital expenditure for overhead distribution is said to be a necessity, and the conference suggested that a further relaxation in the factors of safety and minimum ground clearance at present prescribed could be made without augmenting the already negligible risk to the public.—*Electricity* (*England*), Aug. 2, 1928.

News of the Industry

Trade Commission Hearings Begin Again Tuesday

Further hearings on the propaganda phase of the utilities investigation being conducted by the Federal Trade Commission will begin on Sept. 18. Because of a death in the family of Robert E. Healy, the chief counsel of the commission, the hearings which were to have been held Sept. 13 and 14 were postponed to a date to be announced hereafter. The following witnesses have been subpœnaed to appear on Sept. 18 and 19: H. P. Weeks, Davenport, Iowa, director Iowa Section, N.E.L.A.; J. W. Bennett, Washington, D. C.; C. H. Howell, Atlantic City, president New Jersey Electric Association and chairman of the New Jersey Public Utility Information Committee; William H. Roth, Philadelphia, secretary of the New Jersey Utility Association; A. J. Marshall, New York, secretary National Electric Light Association. It was explained that Mr. Bennett is to present information collected from the Canadian division of the N.E.L.A.

The commission also announced that testimony would be taken concerning a situation which has arisen in Louisiana. After the passage of the Walsh resolution legislation affecting the public utilities in New Orleans came before the Louisiana Legislature. In that connection the commission was advised by one of the city commissioners of New Orleans that the utilities had been guilty of questionable practices, and this led to the dispatch of one of the commission's examiners to New Orleans. The incident promises to raise an interesting question as to the jurisdiction of the commission.

The Government Printing Office now has delivered all of the schedules for the new questionnaire, and the commission has begun to mail them out to operating, financial, construction and maintenance companies.

Alabama Sues Government for Tax on Power Sold

The State of Alabama filed suit against the federal government in the Court of Claims on Sept. 11 to collect $173,051 to cover the tax on hydro-electric power sold by the War Department during the calendar year of 1926. In addition, the state seeks to collect a penalty of 15 per cent and interest at 8 per cent since the tax became due. The petition points out that the state has levied a privilege tax of two-fifths of a mill upon each kilowatt-hour of hydro-electric power manufactured and sold within the state. During 1926, the petition states, the United States sold 432,629,000 kw.-hr. of hydro-electric energy to the Alabama Power Company. When the bill was presented to the federal government payment was refused on the ground that a state may not tax a federal agency.

Rehearing Refused on Big New York Merger

Public Service Commission Denies Petitions from City and Public Committee on Power to Reopen Consolidated Gas-Brooklyn Edison Proceedings

FOUR of the five members of the New York Public Service Commission united on Tuesday, Sept. 11, in denying the petitions for a rehearing in the Consolidated Gas-Brooklyn Edison merger filed by Corporation Counsel Nicholson for the city of New York and Morris L. Ernst for the Public Committee on Power in New York State. Chairman Prendergast of the committee is still abroad, but Commissioner Van Namee has returned and Commissioner Brewster has recovered from his indisposition. Commissioners Lunn and Pooley were also recorded. In refusing the petition the commission said:

> Practically all of the court decisions, in passing upon the question of the right of a person to participate in a proceeding because of "interest," require the interest to be a pecuniary or property interest, or to involve a right or duty of the person in question. We do not see how the Public Committee on Power can show that it is "interested" within this ordinary legal acceptation of the term.
>
> The application by the city of New York for a rehearing is directed to paragraph 4 of the commission's order, which requires the Consolidated Gas Company of New York to record the acquisition of the stock of the Brooklyn Edison Company, Inc., by making certain entries upon its books of account. It would seem to be necessary only to call attention to the fact that such entries relate only to the investment accounts of the Consolidated Gas Company and have no bearing upon the fixed capital accounts of said company or the value of its property devoted to the public service, upon which its rates for gas are based. Furthermore, the memorandum of the commission and the order granting the application specifically provide that nothing in the entire transaction shall be considered, offered or received in evidence in any proceeding, suit or matter hereafter involving the value of the property of the Brooklyn Edison Company, Inc., or its rates or charges.
>
> We are, therefore, of the opinion that the city of New York has likewise presented nothing to justify the commission in granting its application for a rehearing.

Mr. Nicholson is quoted as reluctantly accepting the decision as final so far as the city of New York is concerned. Whether the Public Committee on Power will go into the courts was not known on Thursday.

Water-Power Issue Fails to Register in Maine

If the efforts of the Democratic candidate for Governor of Maine, E. C. Moran, Jr., to make opposition to water-power exportation from that state the chief issue in the state elections held on Sept. 10 were taken seriously by the voters, the only inference is that the citizens are not excited about the alleged danger to the state's natural resources, since a record-breaking majority of nearly 82,000 elected his Republican opponent, William T. Gardiner. As reported last week (page 476), the Republican platform declared for a fact-finding investigation of the water-power situation in Maine, while the Democratic plank on this subject, which Mr. Moran repudiated, favored the permission of exportation. The result of the election appears to leave the issue just where it was, although outside the state itself vociferous antagonists of the "power trust" are seeing in the election a victory for the Insull-owned companies which favor exportation.

Hartford Company's Cut in Domestic Rates

In addition to the payments to customers, employees and stockholders that the Hartford Electric Light Company is to make for the month of October in the form of a 60 per cent rebate on the month's bills, a 60 per cent bonus on the month's wages and a 60 per cent increase in the month's dividends, as noted last week (page 485), the directors have voted that, beginning Dec. 1, the domestic rate schedule at present available to customers using electric cooking or refrigeration shall be made available to every domestic customer regardless of the nature of his use, in order that every customer whose use is sufficient to absorb the slightly higher flat charge (averaging about 1¼ cents per day) may enjoy the benefit of unlimited energy at the low price of 4 cents per kilowatt-hour for light as well as for miscellaneous uses.

A new rate is also to be established of 1½ cents per kilowatt-hour, together with an appropriate fixed charge, available to all domestic customers, in order to enable the average customer wishing to make full use of electricity in his home for normal lighting, cooking, refrigeration, water heating and miscellaneous services to do so at a price (with fixed charge) of about 2¾ cents.

Purchases and Mergers

United Light & Power Company Acquires Control of the American Light & Traction, Thus Forming Holding Concern with Half Billion in Assets

NOT until the publication of the earnings statements of the United Light & Power Company of Chicago on Monday of this week did the result of more or less protracted negotiations for the merger of this company and the American Light & Traction Company of New York become known. It now appears that the first-named holding company has acquired a majority of the voting stock of the other, thus uniting under one control two groups of utility companies with combined assets estimated to be in excess of $522,000,000. Some financial details of the transaction are included under "Financial and Statistical News" on page 535.

The United Light & Power Company controls the Continental Gas & Electric Corporation, under which are grouped such light and power operating companies as the Columbus (Ohio) Railway, Power & Light Company, the Kansas City (Mo.) Power & Light Company, the Iowa-Nebraska Light & Power Company of Lincoln, Neb., the Maryville (Mo.) Electric Light & Power Company and the Canada Gas & Electric Corporation of Brandon, Manitoba. The United Light & Power also controls the Fort Dodge (Iowa) Gas & Electric Company, the Laporte (Ind.) Gas & Electric Company, the People's Gas & Electric Company of Mason City, Iowa, and the Tri-City Railway & Light Company of Davenport, Iowa, the last-named in its turn having as subsidiaries the Iowa City Light & Power Company, the Moline-Rock Island (Ill.) Manufacturing Company, the Muscatine (Iowa) Lighting Company, the People's Light Company of Davenport, Iowa, and the People's Power Company of Moline, Ill. The United Light & Railways Company of Delaware (controlling a Fort Dodge and a Davenport subsidiary) and the United Ohio Electric Company of Columbus (with subsidiaries at Chillicothe, Hillsboro and Athens) are other United Light & Power properties.

Electrical "affiliated companies" of the American Light & Traction Company are the San Antonio (Tex.) Public Service Company and the Madison (Wis.) Gas & Electric Company. Thus the merger adds to the extensive Middle West holdings of the United Light & Power a south-central Texas and a Wisconsin property.

Announcement was made Sept. 1 by J. F. Owens, vice-president of the Oklahoma Gas & Electric Company, of the purchase of the electric plant and system of the Southwest Power Company in Alva, Okla. The Alva properties, which belonged to the Insull interests, were a part of the Southwest Power Company holdings in Oklahoma and Arkansas operated from McAlester, Okla. The plant at Alva serves that city, Hope and Dacoma. Mr. Owens has also announced the transfer of the electric properties in Wanette, Asher and Byars, Okla., from the Earl W. Baker Company to the Oklahoma Gas & Electric.

The Southwest Power Company has sold eighteen electric properties in eastern Oklahoma to the Public Service Company of Oklahoma and is understood to have sold its electric properties in Arkansas to the Southwestern Gas & Electric Company. Both the reported purchasers are, like the seller, Insull subsidiaries.

No opposition was made to the proposed purchase of the Manchester Electric Company by the Connecticut Power Company at a hearing before the Connecticut Public Utilities Commission, and the commission will in a few days authorize the sale.

The electric light plant of Cynthiana, Ind., which has been owned by the town and other stockholders, has been sold to the Public Service Company of Edwardsport, Ind., for $25,000.

The Central Power Company of Grand Island, Neb., has submitted a proposal to purchase the municipally owned distribution system of the plant at Peru, site of one of the large state normal schools, and favorable action is expected. The Central Power Company has bought the distribution system owned by the town of Unadilla, long served by the company at wholesale, following the granting of a 30-year franchise at rates materially below those charged by the village.

The Calgary (Alberta) Power Company has entered the northern Alberta utilities field by acquiring the franchise of the Westlock Electric Light Company. Westlock is about 50 miles north of Edmonton, which gives the company a foothold 250 miles north of its home city. Until a transmission line is built the present plant will be used.

Foreign Lighting Delegates on Tour

Leaving New York, They Visit Boston, Philadelphia, Washington, Cleveland, Detroit and Chicago, Whence They Go to Niagara Falls and Toronto

FOLLOWING an evening at Coney Island as the guests of the Brooklyn Edison Company, in the course of which the spectacular electrical illumination to be seen at that resort came in for appraisal, and their visit on Thursday to the Edison Light Institute at Harrison, N. J., and to Thomas A. Edison's laboratories at West Orange, where they met the great inventor, the sixty-five foreign light specialists now in America and those accompanying them left by special train on Friday morning of last week for Boston. Arriving in that city in the afternoon, they were welcomed by a committee of distinguished utility men headed by Charles L. Edgar, dean of the electrical industry in New England and president of the Edison Electric Illuminating Company of Boston. After headquarters had been established at the Copley Plaza Hotel, a fleet of motor coaches escorted by state police transported the visitors and their hosts to the North Shore district, where dinner was enjoyed at the Tedesco Country Club, Swampscott. Dr. Elihu Thomson greeted the delegates in words of welcome and of challenge toward still greater achievements in the lighting art, after which the party examined many types of street lighting, attended baseball and soccer games on the floodlighted diamond of the General Electric Company's athletic field at Lynn and inspected its lighting department at the River works.

The Boston Edison company opened its Edgar station at Weymouth to the delegates on Saturday morning and served a luncheon there. The afternoon was devoted to vists to Harvard University and the Massachusetts Institute of Technology, and Mr. Edgar officiated in the evening as host at the Country Club, Brookline. Radio greetings were broadcast through station WEEI from this point by president C. C. Paterson of the congress and representatives from France and Germany, and motion pictures were shown of the doings of the visitors and their hosts.

At Philadelphia on Sunday the tourists were greeted by William H. Taylor, president of the Philadelphia Electric Company, as chairman of the local reception committee. They were taken on a tour of the city, visiting Independence Hall, Benjamin Franklin's grave, the Delaware River Bridge, the United States Mint and the University of Pennsylvania. They lunched at Devon Inn, after a trip to Valley Forge. A dinner at the Benjamin Franklin Hotel was followed by a special demonstration of color floodlighting of the new Edison Building.

Journeying to Washington by night, the delegates had their Monday breakfast in the capital. They visited the White House and were formally welcomed by President Coolidge. Among other points of interest to which they were escorted were the Bureau of Standards, the Smithsonian Institution and the National Academy of Sciences. In the evening a tour revealing the floodlighting of various impressive structures was made.

Tuesday afternoon brought the delegates to Cleveland. Here more lighting installations were inspected after dinner at the Hotel Cleveland. Next morning the party went to Nela Park, home office of the National Lamp Works of the General Electric Company, where a full day was spent. After being welcomed by Congressman Charles A. Eaton, an inspection of the Nela School of Lighting was made, followed by a presentation of the home-lighting playlet, "Lit Up," by the engineering department. A trip through the lighting research laboratory, where many displays of light and color are visually demonstrated, preceded a luncheon at Nela Camp. The 50,000-watt lamp built by General Electric engineers was displayed, and just before the travelers departed for Detroit the street-lighting demonstration on East 152d Street, where 40 different methods of lighting streets are set up, was turned on for their benefit.

The program at Detroit on Thursday

called for a visit to the Detroit Edison Company, an inspection trip through the Fischer Body Company's plant, a visit to the River Rouge plant of the Ford Motor Company and a banquet at the Book-Cadillac Hotel. Street and shop-window lighting installations were to be inspected.

A two-day stop at Chicago on Friday and Saturday was planned to enable the party to visit many public buildings and the city's park and boulevard system. An inspection trip through the Union stock yards, the Crawford Avenue generating station of the Commonwealth Edison Company (the official host of the party) and the Western Electric Company's Hawthorne works were scheduled for the morning of the second day.

Arriving at Niagara Falls on Sunday, Sept. 16, the party will be guests of the Hydro-Electric Power Commission of Ontario and the Niagara Falls Power Company. The great hydro-electric generating stations will be inspected and the apparatus for illuminating the falls will be shown.

On the following day the party will arrive at Toronto in time for the opening session of the twenty-second annual convention of the Illuminating Engineering Society, which precedes the International Illumination Congress at Saranac Inn, N. Y.

Power Board Disapproves Feather River Project

Application of the Pacific Gas & Electric Company for a permit covering extensive development on the Middle Fork of the Feather River was denied Aug. 30 by the Federal Power Commission. The application was rejected because the staff of the commission is not convinced that the company is in a position to proceed with the development during the period provided in the water-power act. The company proposed to construct three dams impounding 338,000 acre-feet of water and six power plants with an aggregate installation of 400,000 hp.

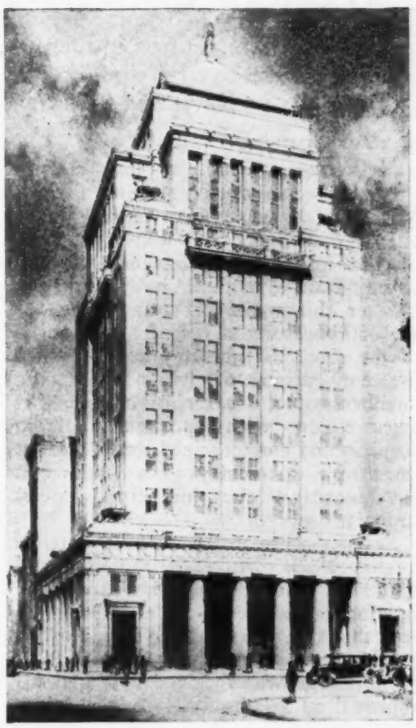
Northeastern Power Transmits Power to Niagara Region

In a statement issued at the close of a directors' meeting at New York on Sept. 11 it was revealed that the Northeastern Power Corporation, controlling the Northern New York Utilities of Watertown and other upstate light and power companies, has signed a long-term contract with the Niagara, Lockport & Ontario Power Company, which became effective Sept. 1, to supply the latter with 40,000 kw. of electricity generated by hydro-electric plants.

The transmission of power toward Niagara for the first time in history was said by Northeastern officials to be due to the limitation of the Niagara Falls output, of which the Niagara, Lockport & Ontario Power uses 130,000 hp. in addition to 92,000 hp. generated in its own plants. The 40,000 kw. to be supplied by the Northeastern represents that company's daytime surplus, which the St. Regis Paper Company's mills absorb at night. The duration of the contract was not revealed.

The Northeastern Power Corporation, which early this summer sold its holdings in the New England Power Association to a group affiliated with the International Paper Company, is said to intend to employ the cash received in this transaction, put at $21,000,000, in the acquisition of additional utility properties, possible in upstate New York.

Cincinnati Company to Have New Office Building



PRELIMINARY steps to the construction of a fifteen-story administration building on a prominent downtown corner in Cincinnati were taken by the Union Gas & Electric Company on Sept. 10 in letting bids for the razing of buildings now on the site. Actual construction work is expected to be started soon after Oct. 20. The new office building, cost of which is estimated at $2,000,000, has been designed in the associated architectural offices of J. Russell Pope of New York and Garber & Woodward of Cincinnati.

The entire new structure will be occupied by the Union Gas & Electric Company and other Columbia Gas & Electric subsidiaries in the Cincinnati district. The ground floor is to house a modern and attractive electric appliance salesroom. Special features of the new building will include an employees' dining room and an auditorium for large important gatherings, conventions and entertainments. At night the new home of the utility company is to be brilliantly floodlighted.

Rural Service Policies

Maryland Utility Men, Meeting at Braddock Heights, Listen to Their Presentation and Discuss Ways of Spreading Farm Service

PROBLEMS involved in supplying electrical energy to rural districts occupied the attention of the electric group of the Maryland Utilities Association at the midyear meeting of that organization, held at Braddock Heights, Md., on Sept. 7. Promotional work, methods of reducing the cost of line construction and the national and local economic features of this activity were discussed.

Colonel G. W. Hill emphasized the commercial features, pointing out that utility men must appreciate the farmer's viewpoint if profitable results are to be obtained and that intensive sales work is essential if full use of energy and a high customer saturation are to be realized. C. H. Leatham, chairman of the rural electric service committee of the association, reported upon the objectives of the association and the progress realized in Maryland. Mr. Leatham pointed out that, while it is felt that service for every farmer in the state who can be advantageously served is now within reasonable reach, it is desired to promote further extensions as well as to make existing ones profitable. He also advocated the adoption of a policy whereby the payment now made by the farmer to secure service may be applied to the purchase of energy-consuming devices.

The national rural electrification project, with particular reference to Maryland, model farms, demonstrations, organization personnel and the sociological factors involved, was discussed by Dr. T. B. Symons of the University of Maryland. The representatives of several Maryland utility companies outlined methods of potential and proved value for reducing line construction costs. H. C. Hoover of the Potomac Electric Power Company suggested lengthened spans, short poles, fewer deep settings, creosoted pine poles, bare wire and local step-up voltage transformation to secure 13,000 volts for rural line taps on 4,000-volt lines, and quoted cost figures of results obtained by this organization. C. N. Davis of the Eastern Shore Public Service Company corroborated the potentialities of longer-span lines and emphasized the advantages of co-operation with the telephone company. C. C. Moler of the Potomac Edison Company thought that rural consumers were not reasonably entitled to the same high-cost service that was required in urban areas and advocated less expensive construction.

Speakers at the banquet included Harry T. Connolly, president of the association, who presided; Emory L. Coblentz, former president, and R. Gray Williams, counsel for the Potomac Electric Power Company. An inspection trip to the Williamsport generating station of the Potomac Electric Power company took place in the afternoon.

Power Commission's Year

Eighty-seven Applications for Hydro Rights Received in Twelve Months Ended June 30—Seventy-one Licenses and Eleven Permits Issued

DURING the fiscal year ended June 30 the Federal Power Commission received 87 applications for water-power rights. This brings the total of all applications since the enactment of the water-power act to 910. Of the new applications, 38 were for preliminary permits and 49 were for licenses. Only five of the 49 licenses, however, covered important projects. The remaining 44 were for transmission lines or minor parts of projects. In addition, seven holders of preliminary permits, one whose permit had expired and two others applied for major licenses. These applications for licenses covered a total of 925,000 hp. The 38 preliminary permits represent 1,925,000 hp. as estimated installed capacity.

At the close of the fiscal year 138 original cases were awaiting action, in addition to 23 other applications for license from permittees. Of that total, 75 were in a suspended status for reasons beyond the control of the commission. These cases include projects on the Colorado, Tennessee, Potomac and St. Lawrence Rivers and cases in litigation in the courts or before the state commissions. This leaves a total of 86 cases on which the commission could act, as compared with 103 at the close of the preceding fiscal year. On June 30, 1928, there were in effect 337 licenses and 58 permits. Allowing for duplications, 529 of the 910 projects had an active status.

The commission acted during the year on 33 applications, of which 25 were granted and six were rejected. One authorization was rescinded and one other was authorized as an amendment to an existing license. Sixty-six cases during the fiscal year were assigned for field investigation. The Departments of War, Interior and Agriculture made reports on 68 projects, and 57 additional ones were under investigation at the end of the year.

Seventy-one licenses and eleven permits were issued. Ten permits expired and four were canceled. Three were superseded by license and two additional ones were disposed of otherwise. Two major licenses and four minor ones were terminated. Of the 337 licenses outstanding, 97 were for major projects and 240 for minor rights. The estimated installed capacity covered by licenses is 6,114,000 hp. and by permits 5,558,000 hp. Eight declarations of intention were acted upon during the year and four are pending.

Some Features of A.E.R.A. Program at Cleveland

For the forty-seventh convention of the American Electric Railway Association, which will be held at Cleveland in the week of Sept. 24, the usual full program embracing the parent body and its four subsidiary associations has been prepared. On Wednesday there will be a general session on "modernization," with addresses by H. G. Bradlee, vice-president Stone & Webster; Alonzo R. Williams of Providence, W. T. Rossell of Pittsburgh, Charles Gordon, editor *Electric Railway Journal*, and C. F. Kettering of Detroit. E. H. Sniffin of the Westinghouse Electric & Manufacturing Company, P. S. Arkwright, president of the N.E.L.A., W. H. Sawyer, president Stevens & Wood, and E. F. Wickwire, vice-president Ohio Brass Company, are others who will address the general sessions, over which R. P. Stevens, president of the A.E.R.A. and the Allied Power & Light Corporation, will preside.

For the Engineering Association sessions, besides copious committee reports, many papers are scheduled. A few of these are "Automatic Substation Installations in Cincinnati," by Harley L. Swift; "Recent Developments in Arc Welding of Rail Joints," by H. C. Heaton, and "Economies by the Use of Labor-Saving Machinery," by W. T. Rossell.

The usual elaborate manufacturers' exhibition will be held.

Western Inspectors Show United Front

At Notable Convention in Denver the 1928 National Electrical Code Is Received with General Approval—Every Article Reviewed—Many Pertinent Addresses

NO MEETING ever held by the Western Section of the International Association of Electrical Inspectors has shown more harmony, constructive activity or united support of the inspectors' program than the twenty-fourth annual convention in Denver this week. It was evident to the 350 representatives of all branches of the electrical industry who attended the convention, of whom 240 were members of the association, that this organization, with its freedom from suspicion of commercial bias, is a great asset to the industry as a whole and one meriting the industry's united support.

Reports were given on every article in the 1928 edition of the National Electrical Code. They showed general satisfaction with the code, but it was seen that there is need for even further development. The report on Article 9 (grounding) was received with general approval of all the 1928 code requirements on this subject, and greater co-operation with waterworks engineers was suggested as a means of assuring full compliance with the requirements for the safe grounding of connections to water systems.

The keynote of the convention was as follows: The 1928 National Electrical Code is a great step in advance and more thoroughly covers the needs of the industry and of inspectors than ever before. More progress, however, is needed, and many of the proposed improvements not included in this edition should be worked up for inclusion in the next. What the consumer needs and deserves are better electrical construction, more safety, more circuits and outlets, better grounding and mechanical protection of wiring.

At Monday morning's session the presidential address by Harley R. Markel was followed by committee reports on show-window and display lighting, architects' specifications, underground systems and power houses and substations. In the afternoon "Inspectors' Problems" was the topic. Changes embodied in the 1928 National Electrical Code were discussed by Dr. M. G. Lloyd, A. Penn Denton, J. F. Beal and Robert B. Shepard. W. J. Canada of the National Electrical Manufacturers' Association discussed the demand-factor table, and H. B. Kirkland, Society for Electrical Development, the proposed uniform electrical ordinance.

Code changes in 1928 were to the fore again on Tuesday, R. B. Shepard, L. F. Adams, V. H. Tousley, C. W. Gustafson, B. M. Slicting, F. A. Cambridge, G. S. Lawler and Dr. Lloyd explaining various articles. The central-station viewpoint and the National Fire Protection Association viewpoint on the grounding of secondaries to water pipes were given respectively by Alexander Maxwell of the N.E.L.A. and Victor H. Tousley of the N.F.P.A. F. S. McCammon of the Public Service Company of Colorado spoke on "The Electrical Inspector"; John M. Bischoff, Commissioner of Buildings and Safety Engineering, Detroit, talked on the administration of electrical ordinances, and W. A. J. Guscott, Denver, discussed special rules.

On Wednesday new participants in code discussion were John A. Poehlmann, W. S. Boyd, B. W. Clark, L. P. Dendel, G. L. Swan and Arthur Halsted. Fremont Wilson, New York, took up the paralleling of refrigerators; George H. Parker, Louisville, gave the fire underwriter's view on electrical inspection, and Victor H. Tousley discussed the relation of the electrical field engineer to the National Electrical Code. Reports of committees were followed by the election of these officers: President, William A. Haig, Milwaukee; first vice-president, L. A. Barley, Denver; second vice-president, A. G. Hall, Toronto; secretary-treasurer (re-elected), William S. Boyd, Chicago.

Elaborate entertainment for the delegates and for ladies accompanying them was provided. This included a civic pageant and an "autumnal fiesta." Thursday was given over to an automobile trip through Denver's parks.

One Thousand at Bedford Springs

Persuading the Farmer, Grappling with Mountain Snow, Inaugurating 220-Kv. Transmission, Adopting Accounting Machines and Selling to the Housewife Among Topics

MORE than a thousand delegates, filling every hotel in Bedford Springs, assembled for the twenty-first annual convention of the Pennsylvania Electric Association on Sept. 5-7, breaking attendance records and attesting the continued popularity of this meeting. The business program as printed last week (page 476) was carried out with the customary success, and the entertainment features were thoroughly enjoyed.

President John S. Wise, Jr., in his address on Thursday morning, referred to the necessity of increasing existing customers' use of energy as the big problem before the industry. He urged simplified state-wide rate schedules, similar in form, with one meter for each customer; co-operation with architects, contractors and builders to increase wiring, and demonstrations of service on actual farms—one demonstration farm per county being suggested. Mr. Wise contended that improvements are still possible with mercury-vapor and binary-vapor systems. He urged that executives attend employee meetings at least twice a year in the interest of good public relations.

C. E. Oakes, submitting a committee report on rural service, told how a joint committee is avoiding long-drawn-out negotiations and described an electrified farms products show at Harrisburg visited by seventy thousand farmers. Six utilities in Pennsylvania have full-time men working on rural electrification, he said, and eight have part-time men. During the first eight months in 1928 1,138 miles of rural line was added, costing $2,141,000 and serving 12,590 customers, making a total of 2,579 miles, costing $5,039,000 and serving 30,253 customers, 7,649 of whom are farmers.

A. B. Millar, the new managing director of the association, painted an interesting picture of the electrical changes that have taken place in Pennsylvania in the last twenty years.

Good Engineering Session

An excellent session was held by the Engineering Section (G. S. Humphrey chairman). Eight printed committee reports were made available, and five interesting addresses were delivered.

E. C. Stone, National Engineering Section chairman, emphasized the need of engineers devising means of securing more system capacity per dollar of investment and of building up and maintaining standards of practice. B. F. Cleaves related some transmission-line experiences of the Penn Central Light & Power Company last April, when the most unusual snowstorm in 50 years in elevated territory occurred. As much as 31 inches of snow, weighing 30 lb. per cubic foot, fell in 24 hours. As a result of this experience the company has adopted more storm guys and dead-end structures, more rugged corner construction, adequate wire holders; class A construction on joint lines, rigid and frequent inspection of lines and facilities for melting ice load on lines. Swinging cross-arms and slipping conductor clamps are now favored. Although the three main generating stations were out of service from 24 to 40 hours, interconnection with adjacent companies enabled prompt restoration of service outside the most severely stricken territory.

N. E. Funk, Philadelphia Electric Company, explained the reason for using 220 kv. for the three-party interconnection in Pennsylvania and New Jersey, citing chiefly the large bulk of power to be transmitted, the importance of reliability and the increased distance between Conowingo and New Jersey should one side of the triangular interconnection be interrupted. Need of reliability also dictated duplicating circuits over separate rights-of-way rather than on the same towers.

Charles F. Kettering, General Motors Company, made a notable address on "Research in Engineering," and S. M. Kintner, assisted by Dr. Thomas, Westinghouse Electric & Manufacturing Company, demonstrated interestingly some "by-products of radio." G. U. Stewart, chairman of the Accounting Section, reviewed progress in that field, emphasizing reports showing the relation of the purchasing department to other departments and explaining a tentative life schedule for records and the method of putting it into effect.

A paper was presented by George Winans, H. L. Doherty & Company, in which the author referred to a variety of office machines available and the desirability of mechanizing office functions. Prosperity has hinged on utilization of machines, and it behooves accounting departments to give them serious consideration, declared Mr. Winans.

At the public policy meeting on Thursday night Preston S. Arkwright, president of the N.E.L.A., with an enthusiasm that betokened his sincerity, outlined the situations which utility companies face that are not encountered in other private business, briefly reviewed past accomplishments, holding that the public had always benefited with the companies, and cited existing policies and practices that show the utilities' recognition that there can be no permanent progress where the public interest is not foremost.

Public relations were again discussed at the Friday morning session of the committee on this subject (J. H. Shearer chairman). Paul S. Clapp, after tracing development in Pennsylvania and outlining benefits that N.E.L.A. activities have brought, expressed his belief that the public would be more interested in facts regarding the magnitude of utility service and the reasonableness of the rates than in emphasis on large capitalization, which often causes alarm, although, as a matter of fact, no single group controls more than 12 per cent of this country's output.

Edmond W. Wakelee, vice-president Public Service Corporation of New Jersey, reminded his hearers that progress in any business is dependent on the public attitude and that good will cannot be secured solely by advertising and publicity. Public attitude is based on service and treatment received, he said. However, no utility can render the best and cheapest service unless regulating commissions exercise even-handed justice. Moreover, without publicity a utility is virtually as helpless as a person without a voice.

Eloise Davison of the N.E.L.A. spoke of the advisability of co-operation in home economics courses and of advice to customers on how best to invest money in electrical appliances.

Commercial Session Doings

At the commercial session, under the chairmanship of P. H. Powers, Chairman-elect H. C. Thuerk characterized the coming year's job as one of selling more kilowatt-hours through teamwork. J. H. Van Aerman, New York Power & Light Company, attributed the present small use of energy largely to inadequate wiring, outlets and switching facilities and failure to create in the minds of the people images of well equipped homes. He reported that sales have been two and one-half times as great where there are twenty outlets instead of six.

A. K. Baylor, General Electric Company, declared that commercial interest is swinging to industrial fields. The present field is only 10 per cent saturated, he said. Electric heat applications offer an annual consumption of double the present power load, besides high load and power factors. Steps recommended to obtain this load were organization, securing of data, attendance at manufacturers' schools, visits to installations, survey of market and the graphing of information.

C. F. Stuart, Northern States Power Company, brought an optimistic story of accomplishments in building the farmers' demand for electrical energy. While Pennsylvania has established a record in extending rural lines and facilities for handling applications and complaints, other parts of the country have concentrated more on building up the energy used per customer. The best satisfied customers are those who use the most energy. Complaints come chiefly from 300-kw.-hr. customers.

J. H. Smith, Fuller Brush Company, related some things that enabled his company's door-to-door salesmen to gain entrance to 11,500,000 homes last year and sell $15,000,000 worth of its products in 5,700,000 of these homes. He expressed the opinion that any product of high utility value that needs demonstration can be sold effectively and directly by teaching customers how to get the most good out of the article sold and by developing customers into boosters. His company's men not only

sell existing equipment but talk about future products. Great emphasis was placed on the caliber of salesmen, their training and the reward for accomplishment. Most important of all is that the salesmen be impressed with the fact that they are selling a service and not a product.

Officers for the coming years were elected as follows: President, F. R. Phillips, Duquesne Light Company; vice-presidents, W. H. Horton, West Penn Power Company, and J. F. Ford. Philadelphia Electric Company.

Grand Falls (N. B.) Plant Approaches Completion

International Paper Company's Plant on St. John River Will Have Initial Installation of 60,000 Hp. — Maine's Rights in Site Protected

COMPLETION of the hydro-electric development of the St. John River Power Company at Grand Falls, on that river, in the Province of New Brunswick, has almost been reached. This plant, which will ultimately have a capacity of 80,000 hp. in four units of 20,000 hp. each, operating under a head of 130 ft., is the largest hydro-electric development in the maritime provinces of Canada. It is expected that the initial installation of 60,000 hp. will go into operation before the end of the year. The output from the plant will be used principally in newsprint mills to be erected by the New Brunswick International Paper Company and the pulp and paper mills of the Fraser Companies, Ltd. The latter organization has completed surveys for a transmission line to carry about 5,000 hp. from Grand Falls to Edmundston, N. B.

The developing company, which is a subsidiary of the International Paper Company, has signed a contract with the Fraser Companies to deliver to them 13,000 continuous horsepower and 7,000 secondary horsepower. Under legislation which permitted the St. John River Power Company to carry out the development, the New Brunswick Power Commission may purchase 6,000 hp. of 70 per cent load factor. A feature of the arrangement is that no power can be exported from the province without the consent of the Governor-in-Council except such as is allocated to the State of Maine by the International Waterways Commission on account of the storage facilities used in that state.

Construction of the Grand Falls plant was commenced in August, 1926. The entire development consists of a control dam above the falls, a pressure tunnel 2,700 ft. long through the rock underlying the town of Grand Falls from the upper to the lower basin, steel penstocks leading from the tunnel to the turbines, and the power station. The wide variation in the natural discharge of the St. John River makes the Grand Falls development essentially a storage undertaking. The general contract was carried out by the Dominion Construction Company of Montreal, at a cost of $1,546,556. For the entire development, including turbines and electrical equipment, the engineers' estimate for the initial installation was $7,900,000.

Briefer News

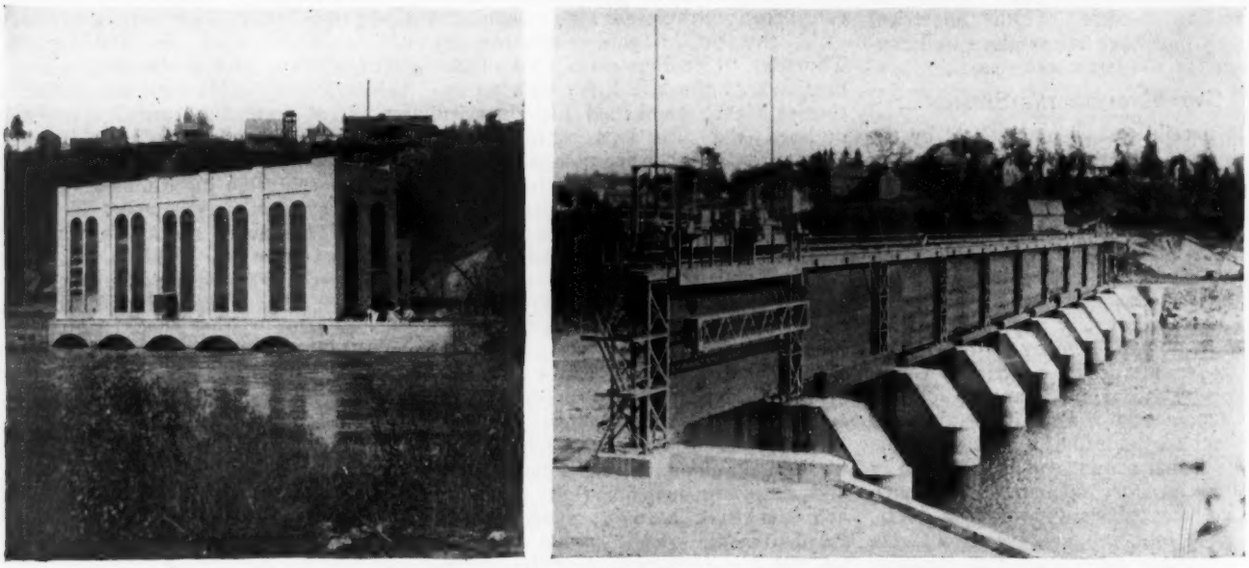
GREEN MOUNTAIN POWER CORPORATION MAKES ITS BOW.—The People's Light & Power Corporation announces that the name of one of its subsidiaries, the People's Hydro-Electric Vermont Corporation, has been changed to the Green Mountain Power Corporation. Its headquarters are at Montpelier.

ARIZONA EMPLOYS JOHN F. STEVENS IN FIGHT ON BOULDER DAM. — Gov. George W. P. Hunt of Arizona has announced that John F. Stevens, former chief engineer of the Great Northern Railroad and chairman of the Panama Canal Commission, has been employed by Arizona to present her opposition to Boulder Dam before the engineering commission now investigating that project. Mr. Stevens, accompanied by Thomas Maddock, an engineer member of the Colorado River Commission of Arizona, made a trip recently to Boulder and other sites on the lower river.

ADDITIONAL EQUIPMENT AT IOWA FALLS.—Work costing $300,000 is just completed on a 3,500-kw. addition to the Iowa Falls power plant of the Central States Electric Company, which maintains headquarters at Cedar Rapids. This development is the first stage in the construction of a new power station to replace the present plant.

LAKE SPAULDING (CALIF.) PLANTS REBUILT. — Two power houses of the Pacific Gas & Electric Company on the slopes of the South Yuba Canyon in Nevada County, Calif., have been rebuilt. They are known as Spaulding Nos. 1 and 2, taking their names from Lake Spaulding, and they are rated at 15,700 hp. One of these plants stands 150 ft. above the other on a granite hillside. A single crew will operate both, the lower power house being governed from the upper. A tramway connects them, but in winter it will be necessary to go from one to the other through a wooden snowshed. Snow sometimes completely covers the lower plant.

WESTERN KENTUCKY 66,000-VOLT LOOP FINISHED. — Electric service in western Kentucky has been greatly strengthened by the completion of the 66,000-volt power loop interconnecting the Graham, Earlington and Paducah generating plants of the Kentucky Utilities Company with the Grand Tower and Muddy generating plants of the Central Illinois Public Service Company. The loop was put into operation a short time ago, after a period of construction lasting for more than two years. The northeast side of the loop crosses the Ohio River at Wabash Island, near Morganfield, and the south-



Power house and main dam of Grand Falls plant on St. John River, New Brunswick

west side at Mound City, Ill., where the steel towers carrying the lines over the river are 351 ft. high, with a water span of 4,500 ft. between them. The lines from Earlington to Morganfield and from Earlington to Paducah are of the steel-tower type.

MISSISSIPPI VALLEY POWER COMPANY PLANS NEW 40-MILE LINE.—Robert C. Coffy, vice-president Mississippi Valley Power Company, a subsidiary of the Standard Gas & Electric Company, announces that approval has been given for building a power line from Fort Smith, Ark., to Ozark, Ark., and installing other electrical equipment. The line will be approximately 40 miles in length and will parallel the state highway most of the distance. It will duplicate, not replace, the company's present line in the same territory.

PARR SHOALS STEAM STATION HAS THRICE PROVED OF GREAT VALUE.—In connection with the starting of work on the installation of a new 30,000-kw. unit in the Parr Shoals steam station of the Broad River Power Company, plans for which have already been noted, the company says that the station, which now consists of a 12,500-kw. unit installed in August, 1925, and a 30,000-kw. unit installed a year later, has already pulled the territory served by it through two extremely dry periods and one month in which high water hampered the hydro-electric plants in the company's system. Since the installation of the second unit industrial companies have never had to curtail their operations because of lack of power, the company reports.

DETROIT HAS POWER EXPOSITION.—In connection with the forty-sixth annual convention of the National Association of Power Engineers, held in Detroit from Sept. 10 to 15, the first national power and mechanical exhibition ever held in that city was opened with more than four hundred exhibits of mechanical and power equipment and machinery. Every phase of engineering —electrical, steam, mechanical, heating and ventilating—was represented. A unique feature claimed for this undertaking is that its sole purpose was to bring the manufacturer and engineer into closer and better contact and that the matter of financial profit received absolutely no consideration in the formulation of plans.

MONTREAL RIVER SITES AND SAULT STE. MARIE (ONTARIO) SERVICE.—It is reported that the Ontario government is in touch with agents, the identity of whom will not be made public at present, with the idea of granting a lease for water-power sites on the Montreal River. L. V. Rorke, director of surveys, admitted in an interview that negotiations were in progress with the Insull interests for sites on the Montreal River. In other quarters it is stated that the agents in question are acting for the Insull interests, but this information has not been confirmed by the government. The property in question formed the basis for the fight at the polls at Sault Ste. Marie last January, won by the Great Lakes Power Company, when the Ontario government contended that the Insull interests, which control this company, had no rights on the river.

MOKELUMNE WATER SYSTEM IN CALIFORNIA TO INSTALL TWO 10,000-HP. TURBINES.—The East Bay Municipal Utility District in California has just placed an order with the Pelton Water Wheel Company for two 10,000-hp. vertical reaction turbines for installation in the Pardee power house of the district. This power is being developed in conjunction with the Mokelumne water supply system for the East Bay cities, and the plant is at the base of the Pardee Dam on the Mokelumne River. The turbines are designed for operation under a variable head from 230 ft. to 325 ft., and the water released will be used by the irrigated farms and riparian owners below. The hydraulic units will be direct-connected to General Electric separators. Most of the electrical energy will be used by the district for pumping and other services.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue for July 7, page 48.]

Illuminating Engineering Society—King Edward Hotel, Toronto, Can., Sept. 17-20. L. H. Graves, 29 West 39th St., New York.

Rocky Mountain District, N.E.L.A.—Hotel Colorado, Glenwood Springs, Sept. 17-20. (With Colorado Utilities Association.) O. A. Weller, Public Service Co. of Colorado, Denver.

Empire State Gas and Electric Association—Saranac Inn, Upper Saranac, N. Y., Sept. 20-21. C. H. B. Chapin, Grand Central Terminal, New York.

American Electrochemical Society—Hotel Kanawha, Charleston, W. Va., Sept. 20-22. C. G. Fink, Columbia University, New York.

American Electric Railway Association—Cleveland, Sept. 22-28. J. W. Welsh, 292 Madison Avenue, New York.

International Committee on Illumination, Saranac Inn, Lake Saranac, N. Y.—Sept. 22-28. (See Illuminating Engineering Society.)

New England Section, N.E.L.A.—Poland Springs House, South Poland Springs, Me., Sept. 24-27. Miss O. A. Bursiel, Statler Bldg., Boston.

Great Lakes Section, N.E.L.A.—French Lick Springs, Ind., Sept. 27-29. R. V. Prather, 205 Illinois Mine Workers' Bldg., Springfield, Ill.

American Society of Mechanical Engineers—Boston, Oct. 1-3. C. W. Rice, 29 West 39th St., New York.

Association of Edison Illuminating Companies—Chamberlin-Vanderbilt Hotel, Old Point Comfort, Va., Oct. 1 to 5. P. S. Millar, East End Ave. and 80th St., New York.

National Safety Council—Hotel Pennsylvania, New York, Oct. 2-5. W. H. Cameron, 108 East Ohio Street, Chicago.

Southern Appalachian Power Conference—Atlanta, Oct. 8-10. W. A. Nelson, Charlottesville, Va.

American Welding Society—Philadelphia, Oct. 8-13. M. M. Kelly, 33 West 39th St., New York.

Eastern Association of Electrical Inspectors—Municipal Bldg., Springfield, Mass., Oct. 10-11. R. Walker, 85 John St., New York.

Kansas Section, N.E.L.A. — Wichita, Kan., Oct. 18-19. H. Lee Jones, 401 National Reserve Bldg., Topeka.

International Association of Municipal Electricians—Hotel Montelson, New Orleans, Oct. 22-26. H. N. Lang, Box 1864, Orlando, Fla.

Public Utilities Association of West Virginia—Hotel Pritchard, Huntington, Oct. 24-25. A Bliss McCrum, 514 Charleston National Bank Bldg., Charleston.

American Institute of Electrical Engineers — Regional meeting, Atlanta, Oct. 29-31. F. L. Hutchinson, 33 West 39th St., New York.

National Electrical Manufacturers' Association—Briarcliff Lodge, Briarcliff, N. Y., Oct. 29-Nov. 1. S. N. Clarkson, 420 Lexington Ave., New York.

SURVEY OF SUSQUEHANNA VALLEY.—A federal survey of the Susquehanna River Valley to determine its possibilities for navigation, irrigation and water power and what necessity exists for flood control has been begun by United States engineers, according to Col. Charles R. Pettis, district engineer, United States Army, stationed at Baltimore. The first phase of the work will be an exhaustive study of the river valley and water flow and the collection of data for use in the final phases. The undertaking will require several months.

IMPROVING SERVICE IN OKLAHOMA.—The Bartlesville and Dewey (Okla.) high-tension line, recently acquired by the Public Service Company of Oklahoma, will receive a greater and more dependable supply of electricity when a line, 19 miles long, now under construction, is completed from Nowata to Bartlesville. This will give Bartlesville and Dewey connection with the central stations of the Public Service company at Tulsa and Weleetka. The line will be 66,000 volts and of H-frame construction. It will be completed early in September.

INDIANA ELECTRIC CORPORATION'S 132-KV. LINE FROM KOKOMO MAY BE FINISHED OCT. 1.—Work on the 132-kv. double-circuit transmission line to run from Kokomo, Ind., to the Grant County line, 18 miles east, was started on Aug. 1 for the Indiana Electric Corporation and will, it is predicted by the contractors, be finished by Oct. 1. This line is to form part of an interconnected 132-kv. system running from Muncie and Marion, Ind., to Kokomo and will thus be interconnected with the system of the American Gas & Electric Company, of which the Indiana General Service Company of Muncie is a subsidiary.

PROGRESS IN NEW MEXICO.—The Federal Light & Traction Company has approved the expenditure of $72,000 for plant improvement for the Las Vegas (N. M.) Light & Power Company. The improvement calls for the installation of a new steam turbine of 1,250 kva., an enlarged cooling reservoir, condensing machinery and the remodeling of the company's buildings.——The New Mexico Public Service Company, serving Farmington, N. M., has obtained permission to make engineering changes at its hydro site on the south side of the Animas River which will give a

greater fall to the turbine. A new power house will be erected there to augment the steam generating plant on the opposite side of the river.

NIAGARA FALLS CLAIMS 99⅞ PER CENT RESIDENTIAL ELECTRIFICATION.—Niagara Falls, N. Y., including the recently acquired La Salle section, has, according to figures recently compiled, only 22 homes within the city limits which do not have electric service connection. This means that 99⅞ per cent of the homes in the city have electric service. The Niagara Electric Service Corporation serves 16,500 resident consumers within the city limits, and the average annual kilowatt-hours used by these consumers exceeds the figures for every other city for which figures have been compiled. As this table includes every city of any consequence in the United States, Niagara Falls claims the distinction of leading the country in average annual use of energy by household customers. According to the table, Niagara Falls shows 1,413 kw.-hr. per residence customer for the year 1927.

SECOND UNIT FOR TACOMA'S HYDRO PLANT WILL SOON GET UNDER WAY.—Engineering work in connection with the second unit of the Cushman power project of the city of Tacoma, Wash., has reached a point where bids for construction of the dam and tunnel can be called for in about six weeks, Commissioner Ira S. Davisson reports. The dam will be built across the canyon of the North Fork of the Skokomish River about 1½ miles below the first Cushman dam. The dam will be 180 ft. above bedrock and contain about one-third the concrete of the upper dam. The tunnel will divert the water from near the rim of the basin to a point 2½ miles below, from where the water will be conducted by steel penstocks to the power house on Hood Canal. These will be 17 ft. in diameter. The power house and generating machinery contracts will be let early in 1929. The ultimate installation of three units of 37,500 hp. each has been decided upon. Probably only one unit will be built at first.

CENTRAL POWER & LIGHT BUYS HYDRO RIGHTS ON RIO GRANDE.—The Central Power & Light Company has purchased all of the water-power rights of Water Improvement District No. 1 of Eagle Pass, Tex., which was recently organized to irrigate a large tract of land and to generate hydro-electric power from water to be taken from the Rio Grande. The terms of the transaction provide that the company shall pay District No. 1 $270,000 per year for the first five years, $265,000 per year for the second five years and $222,000 annually thereafter for use of these rights for a hydro plant. As noted last week, the irrigation district recently obtained a permit to take additional water from the Rio Grande for the power project. The water for irrigation and power will run through a canal parallel to the river, bringing the water from a high point upstream by gravity flow. The canal system will serve 60,000 acres of land. Work on the project is expected to be under way by Nov. 1.

ELECTROCHEMICAL HYDRO PLANT FOR OSWEGO, N. Y.—Floyd L. Carlisle, president of Floyd L. Carlisle & Company, announced at Oswego, N. Y., on Sept. 5 that his organization is perfecting plans for the establishment of an electrochemical plant in that city to be operated by hydro power. It will serve the textile and paper trades. While in Oswego Mr. Carlisle offered to give and install free of charge two electrically driven pumps with a capacity of 13,000,000 gal. daily for use in the city pumping station, to assure his present and future plants an abundance of water for manufacturing purposes.

Recent Court Decisions

COMMISSION'S DENIAL OF APPLICATION FOR HEARING MAY AMOUNT TO CONFISCATION.—The United States District Court for the Southern District of New York, in a hearing in Interborough Rapid Transit Company vs. Gilchrist et al. (Transit Commission), declared: "It is manifest that the commission intended never to accord the plaintiff a hearing on its application, whatever its merits might be. Denial of an application for a hearing, where the statute provides for such application, amounts to confiscation if the rate be too low." (26 Fed. [2d] 912.)*

JURY HAD RIGHT TO PASS ON ALLEGED NEGLIGENCE OF COMPANY IN FAILING TO INSTALL SUFFICIENT GROUND WIRES.—In Richards vs. Kansas Electric Power Company damages were sought for the death of a farmer who was killed by electric shock after a temporary wire supplying his house during the process of moving it had been struck by lightning. His son severed the supply wire, the end of which attached to the power line came in contact with his body and knocked him down. His father rushed to his aid and was killed. The jury found that insufficient groundage at the transformer was the cause and declared the company guilty of negligence. The Supreme Court of Kansas upheld the jury's right so to find against the company's plea that since the proximate cause of the death was the lightning stroke there could be no recovery. (268 Pac. 847.)

ELECTRIC COMPANY, NOT RAILROAD, RESPONSIBLE FOR DEATH OF BOY TRESPASSING ON RAILROAD BRIDGE AND PLACING FOOT ON DEFECTIVE WIRE.—The Rochester Gas & Electric Company but not the New York Central Railroad was liable for the death of an eight-year-old boy (Ferrari) who climbed over a railing on a street bridge belonging to the railroad and fell to the ground when he received a shock from a defectively insulated wire running from a pole to a street lamp under the bridge. This was the finding of the New York Supreme Court, Appellate Division, which affirmed the trial court's verdict as to the electric company and reversed it as to the railroad. That a railroad watchman who saw the boy playing on the bridge failed to order him off did not, the Supreme Court said, make the lad an invitee; he was a trespasser to whom the railroad owed no duty of active vigilance. The electric company, on the other hand, should have foreseen that such an accident might occur, and the boy's status did not affect its liability. (230 N.Y.S. 60.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

INUTILITY OF VALUATION RESEARCHES INTO THE FAR PAST.—In refusing a request from the city of New York that the New York Edison Company be required to prepare an inventory giving the actual original cost of all tangible and intangible property acquired by it in 1901 and still in its possession and use, the New York Public Service Commission said: "It is claimed that upon its organization in 1901 the company entered upon the liability side of its accounts the aggregate amount of securities issued and liabilities assumed, and, after crediting various miscellaneous assets, the 'plant and property' account was entered as a balancing figure. However that may be, it appears that the capitalization of the company has been subject to criticism and investigation by public authority practically ever since its organization. It was thoroughly gone into by the Stevens legislative committee in 1905 and the facts were then fully developed. It was further investigated by the Public Service Commission, First District, in the years 1914 and 1915, in both capitalization and rate cases, and the distinguished expert now representing the city of New York in this case, then a Public Service Commissioner, discussed the matter at length in opinions submitted by him in those cases, but the commission apparently determined that there was no authority to alter conditions as they then existed. It has been frequently referred to in this case, and at the request of the city the company has furnished information at length as to the property acquired by it in 1901 and now possessed and used by it. Furthermore, a most detailed inventory and appraisal of all property now in use has been submitted and has been in the hands of the city's representatives for many months. It is not the cost to the New York Edison Company that the city desires, but actual cost to the predecessor companies. That such information can now be furnished is doubtful, but in any event would seem to serve no useful purpose. It is not conceivable that items of physical property, except land, acquired nearly thirty years ago are unchanged. All of the material facts pertaining to the organization of the company, its capitalization and the property represented thereby have been in the possession of the representatives of the city for many years. The transactions attending the organization of the New York Edison Company were presumably lawful in 1901, when they were consummated. The commission is without power to change the situation now, and nothing will be gained by delving further in this case into the original cost to predecessor owners of property acquired in 1901."

News About Men of the Industry

N. E. Funk Assistant General Manager in Philadelphia

N. E. Funk, formerly chief engineer of the Philadelphia Electric Company, has been appointed assistant general manager of that utility. During nineteen years of service Mr. Funk has been closely identified with the planning and operation of the three large generating stations, as well as with the hydro-electric plant at Conowingo. Starting in a subordinate position, he worked his way successfully up through the ranks, gradually assuming more extensive duties. Early this year he was appointed chief engineer to succeed the late William C. L. Eglin. Mr. Funk will continue as chief engineer of the Susquehanna Power Company and the Philadelphia Electric Power Company. In addition to these activities he will serve as assistant general manager of the Philadelphia Suburban-Counties Gas & Electric Company, organized last year as a result of the merger of the Philadelphia Suburban Gas & Electric Company and the Counties Gas & Electric Company. His early experience was with the Westinghouse Electric & Manufacturing Company and the New York Central Railroad. He has been active in the National Electric Light Association and holds membership in the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and other technical associations.

N. E. Funk

William Robert Sammons, formerly connected with the Knoxville Power & Light Company and more recently identified in an executive capacity with the Servel Corporation, has opened offices in Knoxville as a consulting electrical engineer, specializing in power applications, illumination, specifications and reports. Mr. Sammons is well known in public utility circles in the South, both through his lengthy connection with the Knoxville utilities and through his active participation in the affairs of the Southeastern Division of the National Electric Light Association, of which he is a past-president. Removing to Knoxville in 1905 from Columbia, S. C., Mr. Sammons spent nearly 22 years with the Knoxville Power & Light Company before leaving the central-station field to affiliate himself with the Servel Corporation in Atlanta.

J. M. Bennett, manager of the department of public relations of the Philadelphia Electric Company, has just been appointed manager of public relations for the Philadelphia Suburban-Counties Gas & Electric Company. This subsidiary was formed last year out of the merger of the Philadelphia Suburban Gas & Electric Company and the Counties Gas & Electric Company.

C. R. Phenicie, vice-president of the Wisconsin Public Service Corporation with headquarters at Green Bay, has been placed in charge of the department of business development and expansion, recently formed. This department will have charge of all matters relating to the sale of electricity, gas, transportation, appliances and coke. Advertising and public relations also will be handled through this department.

Horace P. Liversidge, vice-president and general manager of the Philadelphia Electric Company, has been named vice-president and general manager of the Philadelphia Suburban-Counties Gas & Electric Company in charge of the operating, engineering, sales and purchasing departments. Mr. Liversidge was appointed vice-president of the Philadelphia Suburban-Counties company last June and just recently he was made general manager.

H. W. Brooks, consulting power and combustion engineer of New York and St. Louis, sailed for London Sept. 13 for a European visit of several months to make a study of recent developments in power plant practice abroad. From Sept. 24 to Oct. 6 he will attend the meetings of the World Power Conference at the Imperial Institute, London, serving as an official delegate of the American Society of Mechanical Engineers and the International Railway Fuel Association and presenting a paper there on "Pulverized Fuel in Marine Service." Thereafter he will visit the more recent power developments as well as the works of the principal equipment manufacturers both in Great Britain and on the Continent.

Edward F. Ziegler, formerly station design engineer for the Duquesne Light Company, Pittsburgh, and for the Bylesby Engineering & Management Corporation, has been appointed sales engineer in New York City for the J. Leo Scanlon Company, the New York correspondent for Schweitzer & Conrad, Inc.

F. R. Phillips Heads Pennsylvania Association

Frank R. Phillips, vice-president and general manager of the Duquesne Light Company and vice-president of the Equitable Gas Company, was elected president of the Pennsylvania Electric Association at the convention held last week in Bedford Springs. For many years Mr. Phillips has been an outstanding personality in public utility affairs, having spent practically his entire life in the electric railway field. It was in 1926 that he assumed his executive duties with the Duquesne Light Company, after holding the general managership of the Pittsburgh Railways Company, a sister property, for four years. Prior to the tenure of that office he had served as mechanical and electrical engineer for the company. Other positions antedating this connection in Pittsburgh included the Cleveland Railways, the Ohio Brass Company in the capacity of design engineer, the Michigan United Traction Company as chief engineer, the South Covington (Ky.), Cincinnati & Newport Light & Traction as mechanical engineer and the M. A. Hanna Company (Cleveland) in the street railways department.

F. R. Phillips

Mr. Phillips was the original designer of the low-floor car. As an executive he is naturally concerned with all management and policy matters, but he is particularly interested in simplification of organization and rate structures, improved service standards and stimulating new ideas from the rank and file. He has given considerable personal attention to association work, being a past-president of the Pennsylvania Street Railway Association and the American Electric Railway Association and a member of the executive committee of the Pennsylvania Electric Association for two years. He is also a member of the American Institute of Electrical Engineers, the Engineering Society of Western Pennsylvania and the American Gas Association.

F. L. Carlisle Takes Over Machold Duties

F. L. Carlisle, chairman of the board of directors of the Northeastern Power Corporation and of the Eastern States Power Corporation, has been elected president of these two companies to fill the vacancies created by the resignation of H. Edmund Machold to become chairman of the New York State Republican committee. Mr. Machold has been identified with the public utility industry for many years and he has devoted considerable personal attention to the development of the Northeastern Power Corporation and affiliated properties. The election of Mr. Carlisle to the presidencies of these companies makes possible the return of Mr. Machold to the public utility field if he should desire to take up again his former duties at the conclusion of the political campaign.

E. A. MURRAY, formerly assistant electrical superintendent of the Pittsburgh branch of the Byllesby Engineering & Management Corporation, has been promoted to the position of superintendent of the meter and tests division.

FREDERIC C. MACKEY, who has been connected with the Public Service Company of Northern Illinois since 1921, has been appointed sales promotion manager. Mr. Mackey is well qualified for his new position, having many years of industrial management, engineering and sales experience.

O. C. MERRILL, executive secretary of the Federal Power Commission, is en route to London to attend the Fuel Conference being held under the auspices of the World Power Conference. In his absence the duties of the executive secretary of the commission will be discharged by Major Glen E. Edgerton, the chief engineer of the commission.

ROBERT N. HASKELL, vice-president of the Bangor (Me.) Hydro-Electric Company, has been placed in charge of the general commercial and new-business activities of the company following a general reorganization of the commercial department. Working with Mr. Haskell and in direct charge of appliance purchasing and sales personnel will be EARLE E. PARKHURST, formerly of the Pettingell-Andrews Company, Boston (now the General Electric Supply Corporation), and lately of the Bangor company's sales organization. WILLIAM R. WRAY, formerly commercial manager of the company, will continue as manager of its Bangor store.

ALBERT PFALTZ has been appointed publicity director of the National Electrical Manufacturers' Association, New York, according to a recent statement issued by A. E. Waller, managing director of the association. Mr. Pfaltz brings to his new position four years of experience in the electrical business paper field, obtained on the editorial staff of *Electrical Record*. In his position of publicity director of the National Electrical Manufacturers' Association Mr. Pfaltz will direct the publication activities of that organization in addition to his publicity work. He is a graduate of the School of Journalism of Columbia University.

P. H. Chase Appointed Chief Engineer

P. H. Chase, formerly transmission and distribution engineer of the Philadelphia Electric Company, has been appointed chief engineer in charge of electrical engineering, mechanical engineering, engineering analysis and reports, system planning and standardization and drafting. Mr. Chase is succeeding Mr. Funk, who has assumed the duties of assistant general manager. Mr. Chase

P. H. Chase

has had in the course of his engineering career a wealth of experience in distribution and transmission engineering, at first with the Public Service Electric Company of Newark, N. J., and more recently with the American Railways Company of Philadelphia, now the American Electric Power Corporation. It was in 1921 that he joined the Philadelphia Electric Company. Mr. Chase has recently been named chief engineer of the Philadelphia Suburban-Counties Gas & Electric Company. He has done extensive committee work for the Pennsylvania Electric Association and also for the American Institute of Electrical Engineers, the Illuminating Engineering Society and the National Electric Light Association.

C. L. RUPERT, who has been connected with the Duquesne Light Company since 1912, has been appointed superintendent of system operation.

W. C. CULP, for the past year and a half electrical and distribution engineer with the Commonwealth Power Corporation, has been appointed manager of the Cleveland territory of the Tennessee Electric Power Company to succeed Carl R. Hower, resigned. Mr. Culp is a native of Lancaster, S. C., and a graduate of Clemson College. His early experience was with the Toledo (Ohio) Edison Company and with the Spooner-Merril Company in Grand Rapids, Mich.

Obituary

WILLIAM H. YAWGER, vice-president of the Weston Electrical Instrument Corporation, Newark, N. J., died Sept. 3. Mr. Yawger had been failing in health for the past three years and retired from active duty about three months ago. He had been associated with the Weston Corporation and its predecessor for a period of more than 34 years, serving as director of purchases and subsequently as treasurer and vice-president.

FRANK R. SHEPHERD, well known in electrical circles in New Zealand, died suddenly at Auckland late in July. A native of Ramsgate, England, Mr. Shepherd removed to Australia as a young man, following electrical engineering in Sydney and later in Dunedin. Some years ago he was appointed chief electrical inspector and adviser to the Fire Underwriters' Association of New Zealand with headquarters at Wellington. Mr. Shepherd was actively engaged in electrical work up to a few months ago, and in the course of his official duties he visited practically all the electrical undertakings in the Dominion of New Zealand. He was a member of the A.I.E.E.

WILLIAM MAVER, JR., electrical engineer and well known in the field of telegraphy, died Aug. 8, at the age of 77. Though a native of Scotland, Mr. Maver's early life was spent in Montreal and subsequently he removed to New York. In the course of his career he was associated with the Western Union Telegraph Company, the Safety Insulated Wire & Cable Company, the Consolidated Telegraph & Electrical Subway Company, the New York Heat, Light & Power Company and the Baltimore & Ohio Telegraph Company. He was a frequent contributor to the technical press and his text books have been in use in colleges and by the Signal Corps of the United States Army. Mr. Maver was a fellow of the A.I.E.E.

CHARLES A. SEARS, who had been connected with Stone & Webster, Inc., since 1901, died suddenly July 22 at Havre de Grace, Md. Early in his career Mr. Sears was connected with the Seattle Electric Company, the Puget Sound Electric Railway Company and the Puget Sound Power Company. In 1912 he removed to Keokuk, Iowa, with the engineering division to install the generators and electrical apparatus in the Keokuk power station of the Mississippi River Power Company. After completion of the work there he became general superintendent, and in 1919 he was made manager. He remained in that position until the company passed into the control of other interests in the fall of 1925. For the past two years Mr. Sears was in charge of the erection of the mechanical equipment at Conowingo. He was active in the committee work of the A.I.E.E., having been a past-president of the Iowa section.

Financial and Statistical News

Stocks Reach New High

High Money Rates Virtually Ineffective to Check Upward Trend as Western Buying Increases

WITHOUT any apparent external stimulus and in spite of a 7½ per cent call rate, the stock markets again forged ahead at a few points into new high ground for the year, and in a few cases, for all time. Even 8 per cent money early in the week was only temporarily restrictive. Exceedingly heavy buying from out of town, especially from the West, is stated to be a large factor in the upward movement. The consensus of opinion among financial men interviewed by the ELECTRICAL WORLD on the probable future outlook seems to be that periodic technical reactions constitute the only major restrictive influences. It seems apparent that the Federal Reserve authorities do not intend to pursue their restrictive policy. Furthermore, money is plentiful and seems sure to continue so in view of the attraction of high rates.

Most of the spectacular moves this week have been among industrials, but the utilities have been passively firm and a few important rises are noted. American & Foreign Power has been especially strong around $45. This is attributed, partly at least, to a reported contract of a Brazilian subsidiary for extensive improvements in connection with the power, telephone and transit services of the Bahia district. American & Foreign Power touched a new high of 49 last week. Its low for the year was 22⅝.

The bond market for power and light issues has been considerably firmer than at any time during the midsummer period. The effect of the current 7 per cent rate on time money is as yet more or less indefinite. This rate, which is the highest in about seven years, is expected by many to lead to an inflow of funds, as in the case of the call rate, and prove only temporary. In any event, trading seems to be more or less disregarding it. It will, of course, have a bearing on the large volume of new issues still being withheld from the market temporarily.

Eastern Utilities Investments Total $35,000,000

Eastern Utilities Investing Corporation, which was acquired by the Associated Gas & Electric Company in 1925 in connection with one of its large purchases and which operates as an investment trust in the public utilities field, now has investments in excess of $35,000,000, according to a letter to stockholders of the Associated Gas & Electric System, relative to an offering of ten-year 5½ per cent investment certificates of the Associated System. These certificates, which represent an entirely new phase of the capitalization of the Associated System, are exchangeable at the holders' option at any time for stock units of Eastern Utilities Investing Corporation and are being offered to the Associated stockholders at $990 per $1,000 par value certificate, or $99 for partial certificates of $100 par value. Proceeds of the investment certificates will be used for the general purposes of the Associated Gas & Electric System, except to the extent, if any, that additional stock of Eastern Utilities Investing Corporation may be required to make up stock units for exchange. The proceeds of such additional stock will be used by Eastern Utilities Investing Corporation to add to its investments. The sources of income of the Eastern Utilities Investing Corporation are made public and include, besides interest and dividends on securities of the Associated Gas & Electric Company and the New England Gas and Electric Association, the Utilities Power & Light Corporation, United Gas Improvement Company, Consolidated Gas Company of New York, and Edison Electric Illuminating Company of Boston.

NEW ISSUE FOR PLYMOUTH ELECTRIC LIGHT COMPANY.—The Public Utilities Commission has approved a new capital stock issue of 1,000 shares. Par value of the stock is $100.

Massachusetts Utilities Associates Prospers

The name of the Massachusetts Utilities Investment Trust, which was formed in March, 1927, was changed to the Massachusetts Utilities Associates, effective Sept. 1. When the "MUIT," as it was known in financial circles, was formed the expectation was to obtain at least a majority control of a specific group of electric light, power and gas companies operating in the Bay State. Organization in investment trust lines facilitated the exchange of securities in such a way that the trust was not burdened at the outset with dividend charges in excess of the dividend income from its holdings in the constituent companies. The minimum control is now 80 per cent and the trust has automatically changed in status from an investment trust to a holding company. Gross revenues for the seven months ended July 31, 1928, were $5,811,148, against $5,507,605 for the corresponding period last year, and the balance for dividends, depreciation and reserves increased $200,035, to $1,680,646, notwithstanding the fact that more than 40 reductions in prices of gas or electricity were in effect this year that were not in effect in July, 1927. During the year the connected motor load increased from 92,364 hp. to 100,465 hp. and the total number of customers from 161,598 to 169,150.

Half-Billion Dollar Merger Is Consummated

THE merger movement has produced another half-billion dollar public utility. By acquisition of control of the American Light & Traction Company the United Light & Power Company steps forward into the class of major utility systems.

This latest merger is not the result of an overnight transaction, but is the culmination of probably two years of quiet negotiations between leading interests behind both companies. It brings together a system of properties whose joint operation will have obvious advantages to both groups and will produce an exceedingly strong and thoroughly diversified organization.

Something of the magnitude of the new system is seen from the fact that assets of the United system at the end of last year were almost $300,000,000 and of American Light & Traction Company without subsidiaries almost $100,000,000. The total, including all subsidiaries, is over $522 000,000. Gross earnings of the United Light & Power subsidiaries for the year ended Dec. 31 last were $43,599,338 and of American Light & Traction subsidiaries $37,140,778. Electric sales of the United system were 973,641,057 kw.-hr. and of the American Light & Traction group 129,427,585 kw.-hr.

Complete details of the merger will be published in a coming issue.

The recent application of the United Light & Power Company for permission to list 150,000 additional shares of class A common stock on the Chicago Stock Exchange is rumored in financial circles here to represent stock issued by the company to the Koppers Company for a part of the latter's holdings in the American Light & Traction Company.

GERMAN BONDS LISTED ON EXCHANGE.—The New York Stock Exchange has authorized the listing of $20,000,000 of definitive engraved first mortgage 6 per cent sinking fund gold bonds, series A, of the Westphalia United Electric Power Company (Vereinigte Elektrizitätswerke Westfalen G. m. b. H.), Germany, due Jan. 1, 1953, on official notice of issuance in exchange for outstanding interim receipts.

High Productive Operations Continue

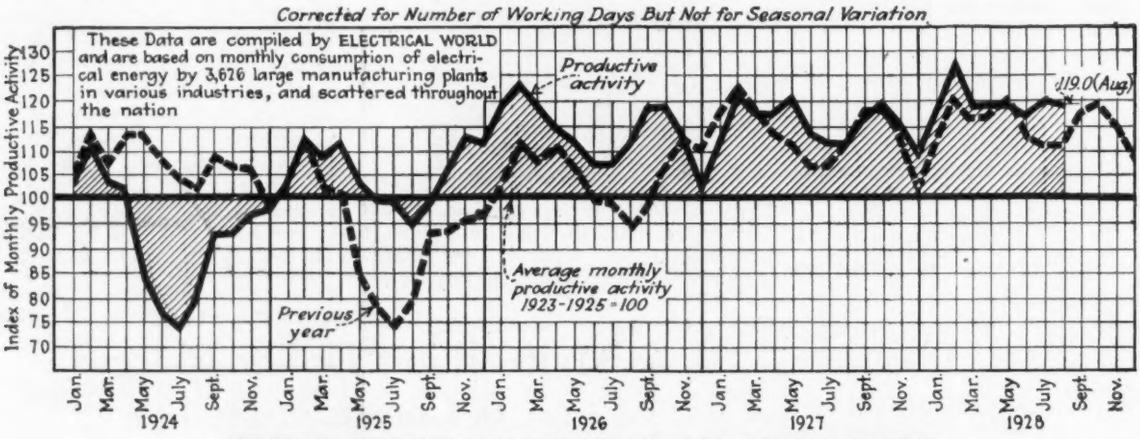
THE summer season closed with the rate of general operations in the manufacturing plants of the nation as a whole on an unusually high plane for this season of the year. Consumption of electrical energy by more than 3,600 large manufacturing plants as reported to the ELECTRICAL WORLD indicate that the rate of productive operations of general industry during August was about 1 per cent under July, but was 7.6 per cent over the rate of operations during August of last year. American industry as a whole has been operating on an unusually high plane ever since last March, and during this five-month period the rate of activity has not varied by more than 4 per cent, while during 1927 the productive activity during this same period varied by more than 10 per cent. There has been practically no so-called "summer slump" in industry during the current year, but on the contrary in several industrial groups the summer operations have exceeded those of the early spring months, an unusual condition in these industrial groups. Contrary to most all expectations the approaching presidential election has had no noticeable adverse influences on the operations of general industry. The first eight months of the current year has witnessed an average rate of operations in general industry about 4.2 per cent above that reported in the same period last year.

August witnessed an upward trend in several of the leading industry groups, both as to July of this year and August of last year. The rolling mills and steel plants reported operations 3.5 per cent over July and almost 18 per cent over August last year. These plants have been reporting increased operations over the same month last year ever since March, but the August increase far exceeded that of any previous month. Last year these plants reported a drop of almost 6 per cent in August as compared with July.

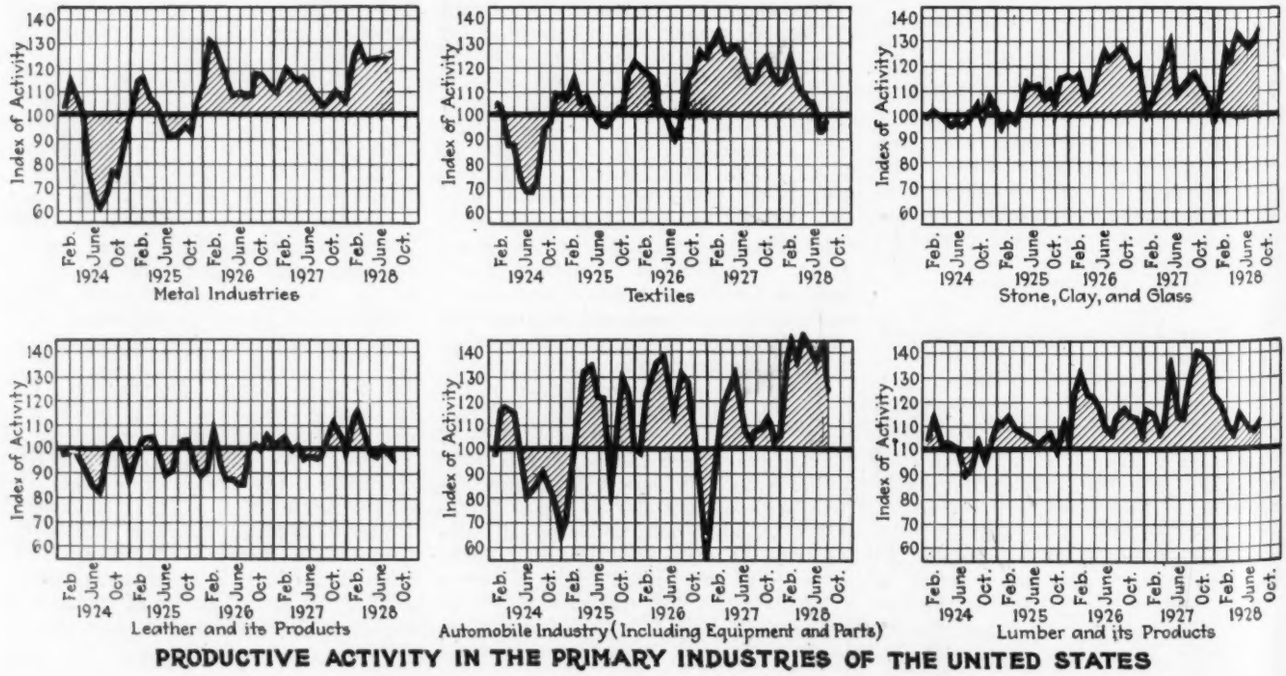
The ferrous and non-ferrous metal-working plants also continued to operate on an unusually high plane. August operations were slightly below those of July, but were about 22 per cent over those of August last year. During the first eight months of the year the average rate of operations was 13.5 per cent over that of the same period in 1927. The automobile industry, which includes the manufacture of replacement and repair parts, recorded a material drop in the rate of operations during August. August operations were about 13 per cent under those of July, but were more than 15 per cent above the productive activity reported during August of last year.

Textiles also took an upward turn in August, after a radically long-time downward trend which started in March. August operations were on a plane 6 per cent above July, but were still about 14 per cent under August of last year.

CANADIAN COMPANY CALLS BONDS.—All of the outstanding first mortgage 5½ per cent sinking fund gold bonds, series A, of the Kaministiquia Power Company, Ltd., Montreal, and first mortgage 25-year 5½ per cent sinking fund registered debenture stock, series A, have been called for redemption Nov. 1 at 104 and interest.



GENERAL INDUSTRIAL ACTIVITY IN THE UNITED STATES



PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE UNITED STATES

Public Service Corporation to Issue Stock

According to present plans a limited amount of $5 cumulative preferred stock without nominal or par value of the Public Service Corporation of New Jersey will be offered to the public under the popular ownership plan beginning Oct. 1. The stock may be paid for in full in cash or under the partial payment plan at $10 per share down and further payments of $10 per share per month for nine months. Interest at the rate of 5 per cent per annum will be paid by the corporation on all installment payments.

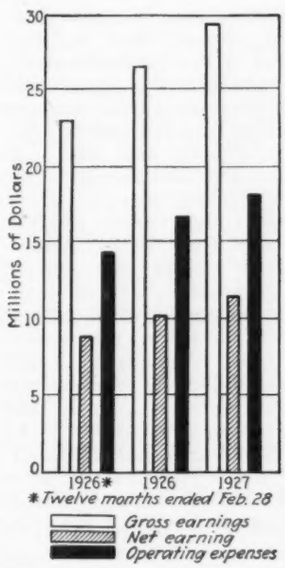
GEORGIA UTILITY RECEIVES AUTHORIZATION.—The Georgia Power Company has just been given authority by the Public Service Commission of the state to issue 100,000 shares of five-dollar preferred stock. Of the proposed issue, 88,000 shares will be exchanged for 80,000 shares of six-dollar preferred stock held by the Southeastern Securities Company, the stockholders of the company having agreed upon the exchange on a basis of 1.1 for 1. The remaining 12,000 shares will be offered to the public, officials state, at not less than $93 a share, the proceeds to go for various developments and improvements on properties of the company.

NEBRASKA UTILITY TO REPLACE 7 PER CENT ISSUE.—The Central Power Company of Grand Island, Neb., has applied to the State Railway Commission for authority to cancel all of its outstanding shares of 7 per cent preferred stock and substitute therefor the same class of stock in an equal number of shares of the same par value, bearing cumulative dividends at the rate of 6 per cent. In its application the company points out that in order to secure the necessary supplies of money for additions and betterments it is no longer necessary to pay the higher rate, and that a material saving in fixed charges will follow the substitution of the lower rate on its entire preferred issue.

Engineers Public Service Earnings Increase 10 per Cent

THAT good progress was made by the Engineers Public Service Company during the year 1927 is revealed by the comparative financial statements contained in the annual report. Gross earnings of the company and its subsidiary companies totaled $29,486,131, as compared with $26,627,687, an increase of 10.7 per cent. Part of this increase was due to the acquisition of the Ponce Electric Company, but, eliminating the earnings of this company, the increase amounted to 9.8 per cent. The average net return shown by the properties for the year was slightly less than 6 per cent on their net book value. To the gross the light and power department contributed $17,811,262, or 60.4 per cent. Operating expenses and taxes amounted to $18,107,259, against $16,515,367 in the preceding year, leaving net earnings of $11,378,872 as compared with $10,112,320, an increase of 12.5 per cent. The comparative income statement of the Engineers Public Service Company showed total earnings of $2,875,774, as compared with $2,127,073 in 1926 and net earnings of $2,718,821, against $1,983,701. Balance after interest and dividends amounted to $561,576.

Total assets of the Engineers Public Service Company and subsidiaries as of Dec. 31, 1927, amounted to $169,281,107, as compared with $154,673,975 as of Dec. 31, 1926, an increase of $14,607,132. The report of the individual subsidiary shows that the properties of this Stone & Webster company are in excellent condition, every company reporting a substantial increase in net with the exception of the Key West Electric Company, which showed a decrease of $27,307. This drop of nearly 10 per cent was largely accounted for by loss of business in the bus department. During the year 1927 $3,518,403 from earnings was reinvested in the properties of the subsidiary companies. The combined reserves and surplus of the company and its subsidiaries as of Dec. 31, 1927, amounted to 72 per cent of the annual gross earnings, or 14.1 per cent of the book values of the properties. In addition the properties have been maintained in excellent physical condition, 8.1 per cent of the gross earnings having been expended in 1927 for maintenance. At the end of the year the combined subsidiaries of the Engineers Public Service Company were serving a population of 2,483,900 and electric customers connected totaled 200,732. Generating capacity amounted to 298,976 kw. and the output to 746,521,859 kw.-hr.



Engineers Public Service reports consistent growth in earnings

Engineers Public Service Company and Subsidiaries

	1927	1926
Gross earnings	$29,486,131	$26,627,687
Expenses and taxes	18,107,259	16,515,367
Net earnings	11,378,872	10,112,320
Interest, dividends, etc.	7,344,169	6,928,442
Balance after dividends, etc	4,138,999	3,399,628
Retirement reserve	1,745,871	2,245,948
Balance applicable to reserves and common stock of Engineers Public Service	4,034,703	3,183,879
Virginia Electric & Power and Subsidiaries		
Gross earnings	$15,471,570	$14,378,199
Operating expenses and taxes	9,188,962	8,684,423
Net earnings	6,282,609	5,693,777
Interest, amortization charges and rentals	1,563,300	1,620,112
Net income	$4,719,308	$4,073,664
Key West Electric Company		
Gross earnings	$260,048	$287,356
Operating expenses and taxes	162,299	185,100
Net earnings	97,749	102,255
Interest and amortization charges	30,142	31,295
Net income	$67,608	$70,960
Eastern Texas Electric Company and Subsidiaries		
Gross earnings	$7,214,132	$5,657,495
Operating expenses and taxes	4,601,025	3,734,698
Net earnings	2,613,107	1,922,796
Income from other sources	23,913	246,496
Total income	2,637,020	2,169,292
Interest, amortization charges, dividends, etc.	1,441,044	1,162,762
Net income	$1,195,976	$1,006,530
El Paso Electric Company and Subsidiaries		
Gross earnings	$2,998,271	$2,836,915
Operating expenses and taxes	1,863,404	1,767,491
Net earnings	1,134,868	1,069,424
Income from other sources	8,623	
Total income	1,143,491	1,069,424
Interest and amortization charges	182,233	165,394
Net income	$961,258	$904,030
Savannah Electric & Power Company		
Gross earnings	$2,227,380	$2,233,704
Operating expenses and taxes	1,310,033	1,402,681
Net earnings	917,347	831,023
Interest and amortization charges	443,046	362,094
Net income	$474,300	$468,930
Baton Rouge Electric Company		
Gross earnings	$1,017,110	$960,479
Operating expenses and taxes	644,893	597,601
Net earnings	372,216	362,878
Interest and amortization charges	70,364	69,492
Net income	$301,852	$293,386
Ponce Electric Company		
Gross earnings	$341,308	$334,926
Operating expenses and taxes	239,700	237,601
Net earnings	101,608	97,324
Interest and amortization charges	1,181	772
Net income	$100,427	$96,553

BINGHAMTON UTILITY TO INCREASE COMMON AND PREFERRED.—Stockholders of the Binghamton Light, Heat & Power Company, a subsidiary of the General Gas & Electric Corporation, at a special meeting held Aug. 23 authorized an increase in the capital stock from 175,000 to 275,000 shares, the preferred stock being increased from 125,000 to 175,000 shares and the common from 50,000 to 100,000 shares, all of no par value. The new preferred stock will be classified as $5 cumulative preferred. In connection with the new financing President W. S. Barstow said that the growth of the company required extensions to lines and additions to

plants and other facilities which must be financed through the sale of common and preferred stocks as well as bonds. The authorization of the $5 cumulative preferred stock will place the company in a position to do new financing on favorable terms.

ASSOCIATED GAS STOCK EXCHANGE TERMS ANNOUNCED.—The Associated Gas & Electric Company has announced preliminary steps in replacing preferred stocks bearing a high dividend rate with an issue of $5 preferred. Holders of the $7 dividend preferred stock have received an offer of two and two-tenths shares of class A stock or one and one-tenth shares of $5 dividend preferred and one-tenth of one share of common stock for each $7 dividend share now held. The offer is on the basis of $50 a share for class A stock and $110 a share for the $7 dividend preferred, or $5 more than the call price for the latter issue. The offer of exchange for the $5 dividend preferred is at $105 a share for the $7 dividend preferred and about $95 for the new $5 dividend preferred without an additional charge for the one-tenth of one common share. The stock to be exchanged under these offers must be received by Oct. 15. As the amount of class A stock available is limited, the offer of exchange for that stock may be entirely withdrawn or its terms modified before Oct. 15. Holders of other series of preferred stock were made offers similar in principle.

Utilities Re-enter Market on Large Scale

FOLLOWING the lull of the summer months, September ushered in the new season for electric light and power companies with a flock of new issues. The total amounts to approximately $100,000,000 and embraces mortgage bonds, debentures and preferred stock. The fifteen-million-dollar offering of the Alabama Power Company was discussed in the Sept. 8 issue of the ELECTRICAL WORLD. During the week under review the North American Edison Company brought out an issue of 5½ per cent debentures, series B, priced at 100 and interest, a piece of financing involving a total of $20,000,000. These securities, dated Aug. 15, 1928, and maturing Aug. 15, 1963, were issued to raise funds for the payment of unfunded debt of the company and for other corporate purposes.

The Rochester Central Power Corporation made an offering of 5 per cent gold debentures, series A, amounting to $22,500,000, at 90 and accrued interest. This corporation, organized last June, controls the Rochester Gas & Electric Corporation, the Empire Gas & Electric Company, the Elmira Water, Light & Railroad Company and the New York Central Electric Corporation.

Another substantial offering was made by the Georgia Power Company in the form of first and refunding mortgage gold bonds totaling $15,000,000, the price being 98 and interest to yield about 5.12 per cent. The proceeds from the sale of these 5s of 1967 will be used to reimburse the company for expenditures for additions and improvements to its property and will provide funds for further additions and improvements and for other corporate purposes.

Two ten-million-dollar issues appear among the new offerings. Convertible preferred stock of the Central States Electric Corporation was offered to that amount at $98 per share, convertible, at the option of the holder, into common stock of the company at the rate of one share of common stock for each $118 par value of this preferred stock. Proceeds are to be used to acquire additional investments and for other corporate purposes. The Illinois Power & Light Corporation offered first and refunding mortgage gold bonds, series C, at 96 and interest, yielding over 5¼ per cent, an issue involving a total of $10,000,000.

The Salt River Valley Water Users' Association made an offering of Stewart Mountain Power Project 5½ per cent serial gold bonds, amounting to $4,100,000, at prices, all maturities, to yield about 5.70 per cent. These securities, dated June 1, 1928, fall due serially Oct. 1, 1931, to June 1, 1958.

Gold debentures, series A, of the Pennsylvania Gas & Electric Corporation were offered to the amount of $2,500,000, the price being 99½ and accrued interest, to yield over 6 per cent. The Arizona Edison Company issued first mortgage 5 per cent gold bonds, series of 1948, totaling $1,000,000.

UTILITY COMPANIES CALL BONDS.—First mortgage 5 per cent gold bonds of the Kentucky Public Service Company, due 1941, were called for redemption at 102½ and interest and all of the outstanding first refunding and improvement mortgage 5 per cent gold bonds of the Sandusky Gas & Electric Company, due 1945, were called for redemption Sept. 1 at 103 and interest. The Fort Smith Light & Traction Company called for payment all of the outstanding first mortgage 5 per cent sinking fund gold bonds, dated March 1, 1911, at 105 and interest and the Mississippi Valley Power Company called all of the outstanding first mortgage gold bonds, series A, on that same date at 104 and interest.

PEOPLES LIGHT & POWER ANNOUNCES DIVIDEND OPTION.—Directors of the Peoples Light & Power Corporation have declared a quarterly dividend of 60 cents a share on class A common stock for the period ending Sept. 30, payable on Oct. 1 to stockholders of record on Sept. 8. It was announced that holders of class A common might apply this dividend to the purchase of additional shares of that stock at the rate of one-fiftieth of a share for each share held. This is at the rate of $30 a share for additional stock and represents an annual basis of 8 per cent in stock. Heretofore the company has paid dividends in cash only, at the rate of $2.40 annually.

AMERICAN COMMUNITY POWER COMPANY DECLARES INITIAL DIVIDENDS.—Directors of the American Community Power Company have declared the initial quarterly dividend of $1.50 per share on the first preferred and also an initial quarterly dividend of $1.50 per share on preference stock, both payable Oct. 1 to holders of record Sept. 15. The American Community Power Company was organized last June as a holding company to acquire the outstanding common stock of the Community Power & Light Company and the General Utilities Company.

Current Earnings Reports of Utility Companies Reflect Health

	1928	1927	Per Cent Increase	Operating Ratio 1928	Operating Ratio 1927
Associated Gas & Electric System (Year ended June 30)					
Gross earnings	$41,368,723	$32,376,230	28.0	54	54
Net earnings	18,267,065	14,955,455	22.0	..	..
Commonwealth Power (Year ended July 31)					
Gross earnings	56,060,478	51,818,618	8.2	52	53
Net earnings	26,706,084	24,086,025	10.9	..	..
Engineers Public Service (Year ended July 31)					
Gross earnings	30,527,370	28,555,123	20.4	59	61
Net earnings	12,240,642	10,952,406	11.7	..	..
Kansas City Power & Light (Year ended July 31)					
Gross earnings	13,384,305	11,681,898	14.5	51	48
Net earnings	6,521,968	6,016,819	8.3	..	..
Los Angeles Gas & Electric (Year ended July 31)					
Gross earnings	$21,498,316	$20,679,371	3.9	55	54
Net earnings	9,618,361	9,546,287	0.7	..	..
Penn-Ohio Edison and Northern Ohio Power (Year ended July 31)					
Gross earnings	25,906,681	25,664,501	0.9	60	64
Net earnings	10,217,710	9,065,850	12.7	..	..
Portland Electric Power (Year ended July 31)					
Gross earnings	12,335,152	12,057,289	2.3	59	60
Net earnings	5,031,708	4,771,288	5.5	..	..
Southern California Edison (Year ended July 31)					
Gross earnings	33,007,508	29,833,073	11.0	34	34
Net earnings	22,217,085	19,793,026	12.0	..	..

Business News and Market Conditions

Electrical Exports Up 17 per Cent

EXPORTS of electrical equipment during July, totaling slightly under $10,000,000, registered a rise of 17 per cent over the total for July, 1927, which was $8,470,724. Foreign advertising and sales promotion is gradually building a steadily expanding market for these products abroad.

Tabulation of the articles of export by destination shows that Canada is by far the largest individual buyer, having taken $2,605,902 worth of equipment, or over 26 per cent of the total, during July.

The export trade of the United States has held up remarkably well during the past year. During the period of the year roughly from October to July there is normally a decline of more than one-third, in value of exports. This year the drop was only 22 per cent. Normally, exports expand from July on, when the grains, cotton, etc., move in large volume, and it is anticipated that this year's full returns will show the largest total since the depression of 1920-21. This year to date the increase has been due chiefly to finished manufactures, including, of course, electrical goods of all classes. The exports of crude materials and foodstuffs have declined, but this should be made up later in view of the very satisfactory crops. Although Europe has contributed somewhat to the growth, it has not been a dominant factor. Sales to other parts of the North American continent have shown very healthy gains.

Value and Destination of Electrical Exports for July, 1928, Compared with Corresponding Month in 1927

(Issued by Bureau of Foreign and Domestic Commerce)

Article	July 1927	July 1928
Generators:		
Direct current—		
Under 500 kw	63,699	111,532
500 kw. and over	24,722	78,607
Alternating current—		
Under 2,000 kva	22,784	39,807
2,000 kva. and over	96,910	.....
Steam turbine generator sets	137,160	117,224
Accessories and parts for generators	157,740	110,754
Self-contained lighting outfits	111,421	103,489
Batteries:		
Flashlight batteries	188,164	198,534
Other dry and wet primary batteries	291,098	222,230
Storage batteries	295,851	319,662
Transforming or converting apparatus:		
Power transformers	60,082	.....
Power transformers 500 kva. and over	.....	124,051
Distribution transformers, less than 500 kva	.....	71,402
Other transformers	75,660	.....
Instrument transformers	.....	1,109
Other transformers, not elsewhere specified	.....	71,257
Battery chargers under 15 amp	.....	27,229
Rectifiers, double current and motor generators, dynamotors, synchronous and other converters	85,695	65,597
Transmission and distribution apparatus:		
Switchboard panels, except telephone	113,241	258,509
Switches and circuit breakers over 10 amp	140,705	180,188
Fuses and fuse blocks	26,045	40,847
Watt-hour and other measuring meters	23,928	96,463
Volt, watt, and ampere meters, and other recording indicating, and testing apparatus	140,396	.....
Electrical indicating instruments	.....	41,006
Electrical recording instruments	.....	23,368
Other electrical testing apparatus	.....	67,357
Lightning arresters, choke coils, reactors, and other protective devices	57,841	107,628
Motors, starters, and controllers:		
Motors under 1 hp	301,669	.....
Motors ¼ hp. and under	.....	194,852
Motors over ¼ and under 1 hp	.....	69,807
Stationary motors:		
1 to 200 hp	227,553	198,532
Over 200 hp	80,390	52,137
Railway motors	146,878	10,179
Electric locomotives—		
Railway	.....	.....
Mining and industrial	51,469	36,382
Station and warehouse electric motor trucks	18,428	18,807
Starting and controlling equipment—		
For industrial motors	72,508	99,717
For electric railway and vehicle motors	21,767	20,826
Portable electric tools	66,518	127,733
Accessories and parts for motors	238,'67	277,985
Electric appliances:		
Electric fans	120,823	97,569
Electric lamps—		
Metal filament	132,131	144,698
Other electric lamps	31,554	49,490
Flashlights	201,012	208,359
Searchlights and projectors	66,619	58,817
Motor-driven household devices	166,534	.....
Electric vacuum cleaners	.....	124,095
Other motor-driven devices, except tools	.....	67,706
Domestic heating and cooking devices	143,340	.....
Electric flatirons	.....	26,161
Electric cooking ranges	.....	17,315
Other domestic heating and cooking devices	.....	76,083
Industrial electric furnace and ovens	41,134	74,521
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc.	116,453	165,022
Signal and communication devices:		
Radio apparatus—		
Transmitting sets and parts	20,377	21,361
Receiving sets	185,079	377,087
Tubes	86,190	84,759
Receiving-set components	167,768	205,024
Receiving-set accessories	159,966	260,204
Telegraph apparatus	34,338	62,737
Telephone apparatus—		
Telephone instruments	27,634	30,571
Telephone switchboards	113,502	30,244
Other telephone equipment	156,412	187,067
Railway signals, switches and attachments	113,590	65,904
Bells, buzzers, annunciators and alarms	17,399	17,845
Other electric apparatus:		
Spark plugs, magnetos, and other ignition apparatus	172,932	.....
Spark plugs	.....	139,865
Other starting, lighting, and ignition equipment	.....	124,740
Insulating material	110,996	131,851
Metal conduit, outlet and switch boxes	74,826	115,414
Sockets, receptacles, and lighting switches	133,615	155,628
Electric lighting fixtures, interior and street	131,079	.....
Electric interior lighting fixtures	.....	175,658
Electric street lighting fixtures	.....	19,912
Other wiring supplies and line material	216,399	88,642
Other electrical apparatus not elsewhere specified	587,596	805,064
Rubber and friction tape	38,440	49,792
Globes and shades for lighting fixtures	57,078	54,236
Electrical glassware except for lighting	29,647	31,379
Electrical porcelain:		
For less than 6,600 volts	37,748	55,661
For 6,600 volts and over	32,277	41,836
Carbons, carbon brushes, and electrodes:		
Electrodes for electric furnaces	104,838	148,793
Other carbon products	112,968	53,429
Insulated wire and cable (iron or steel)	15,445	22,517
Copper, bare wire	126,367	509,216
Copper, insulated wire and cable	544,326	394,373
Refrigeration sets up to 1 ton capacity	368,942	573,748
Domestic washing machines	85,260	189,014
Totals	$8,470,724	$9,920,208

DESTINATION OF ELECTRICAL EXPORTS

Country of Destination	Value July, 1928
EUROPE:	$1,976,643
Belgium	68,222
France	135,010
Germany	399,619
Italy	134,014
Netherlands	74,876
Spain	158,226
Sweden	84,438
United Kingdom	639,634
Other countries	282,604

Country of Destination	Value July, 1928
WESTERN HEMISPHERE:	$5,338,110
Canada	2,605,902
Mexico	408,490
Cuba	274,958
Argentina	674,049
Brasil	402,296
Chile	144,698
Colombia	206,488
Peru	41,335
Venezuela	114,428
Other countries	465,466

Country and Destination	Value July, 1928
ASIA, AFRICA AND OCEANIA:	$2,605,455
British India	356,175
China	209,285
Japan	574,459
Philippine Islands	207,135
Australia	640,251
New Zealand	137,805
Union of South Africa	201,345
Other countries	279,000

Market Conditions

WHILE the end of the summer marks no perceptible change in the volume of electrical equipment purchased, autumn business is coming in at a decidedly satisfactory rate. Reports received by the ELECTRICAL WORLD from all sections of the country indicate a range of business from satisfactory to well above average.

In the eastern half of the country there is a fairly uniform improvement. Power equipment sales feature New England business. In the Eastern district prime movers and affiliated equipment are in better demand than since early summer. The Southeast reports no head-line orders but satisfactory day-to-day volume.

Farther west there is a greater diversity in business volume. The St. Louis district is fairly quiet this week. Predicted activity in the oil fields, however, is materializing. The Middle West records a decided betterment in volume of orders and the Pacific Coast district shows an unusually satisfactory volume of sales. Building is active in this area and some sizable equipment orders are recorded.

Copper Sales Break Record—Lead Active

Sales of copper during the week ended Wednesday were the largest in almost two years and a new record was established. Price continues unchanged at 14.75 cents per pound delivered, Connecticut Valley basis. The activity in copper has been the outstanding feature of the week's business, though an average volume of lead changed hands with prices virtually unchanged and tin, following a mid-week downward sag in prices, is somewhat stronger again today and closes the week without appreciable net change in price. Zinc buying has been almost negligible though no tendency toward lower prices is observed. Antimony price is somewhat firmer; cadmium, arsenic, and the platinum metals continue unchanged.

NEW YORK METAL MARKET PRICES

	Sept.. 5, 1928 Cents per Pound	Sept. 12, 1928 Cents per Pound
Copper, electrolytic	14.75	14.75
Lead, Am. S. & R. price	6.40	6.40
Antimony	10.00	10.75
Nickel, ingot	35	35
Zinc, spot	6.60	6.60
Tin, Straits	47.375	47.50
Aluminum, 99 per cent.	24.30	24.30

Base copper wire price Sept. 12, 1928, 16½ cents.

Southeast Reports Satisfactory Business

Reasonably satisfactory general business but no outstanding features continues in the Southeast. One central-station company ordered 105,000 lb. of weatherproof and 10,000 lb. of bare copper wire together with creosoted pine poles amounting to $5,900 and pole line hardware totaling $11,000. Another central-station order was for distribution and small power transformers amounting to $3,500. A boiler plant and foundry in Georgia has signed a contract for central-station service and will purchase one direct connected motor-driven full automatic cupola blower, a 1,000-ft. motor-driven air compressor, a 100-kw. motor-generator set and miscellaneous equipment, the equipment to cost $15,000. A rayon plant in the same state ordered three 1,000-kva. transformers. Switching equipment amounting to $15,000 was ordered by the Sewerage and Water Commission in New Orleans. One jobber ordered wiring materials amounting to $1,500 for a cotton mill job while another jobber ordered ceiling fans costing $1,300 for a small hotel. Construction projects are as follows:

The General Shale Products Corporation, Kingsport, Tenn., plans extensions in its local plant, to cost $85,000. The Mississippi Power & Light Company, Jackson, Miss., plans extensions in its substation at Clarksdale, Miss., to cost $60,000. The Duel Power Company, Robertsdale, Ala., plans a power plant at Castleberry, Ala. The Southern Lime Products Company, Cordele, Ga., will build a plant to cost $200,000. Montgomery, Ala., and Rome, Ga., plan improved lighting systems. The Georgia Power & Light Company, Valdosta, Ga., plans a transmission line from Waycross to Pearson, Hoboken, Schlatterville and vicinity. The Forest Products Engineering Company, Chicago, plans a lumber plant near Fort Lauderdale, Fla., for manufacture of fruit containers, crates, etc., to cost $85,000. The Arnot Bakery Company, Jacksonville, Fla., plans a plant to cost $100,000. Palmetto, Fla., has authorized plans for a municipal power plant, to cost $100,000. The Graham Paige Motor Company, Detroit, Mich., plans a lumber and woodworking plant at Perry, Fla., to cost $130,000. The Firestone Tire & Rubber Company, Akron, Ohio, plans a branch and distributing plant at Tampa, Fla., to cost $100,000.

Power Equipment Sales Active in New England

Increased activity in buying of electrical power equipment was reported in the New England district. An order for equipment, amounting to $70,000 and consisting of motors and generators was received from Connecticut and another order of interest from southern New England is noted comprising two turbo-generators and control equipment amounting to $35,000. Small motor sales are gaining and the total as reported by one manufacturer reached $38,000. Fractional-horsepower motors are active, and according to one manufacturer are moving steadily with gains over last year.

Central-station supplies are active while deliveries are being rushed on supplies for line extensions and orders for insulators, cable, wire and line hardware are being received in small lots but in good volume. Negotiations are more active and an industrial department manager forsees favorable business prospects for the coming fall. Construction projects are as follows:

The New Departure Manufacturing Company, Bristol, Conn., plans an addition to its ball bearing plant to cost $100,000. The United Illuminating Company, New Haven, Conn., plans a power substation. The Seth Thomas Clock Company, Thomaston, Conn., plans an addition to cost $75,000. The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until Sept. 18, for pyrometers for generator-engines at the Portsmouth, N. H., navy yard (Schedule 9654.)

Improved Call for Prime Movers in Eastern District

There is an improved tone to the demand for prime movers and affiliated equipment in the Eastern district. A paper-manufacturing company in New Jersey has placed an order for turbine equipment to cost $40,000.

A gas company in Tennessee has ordered electric generating apparatus from a manufacturer in New York, placing a commitment for engine units with an Ohio maker. A municipality in Arkansas has given an order for a geared turbine unit for pumping station service to cost $20,000. Several central-station companies in northern New York are in the market for prime movers. One utility company has inquiries for a turbine unit to cost $150,000, while another will make a 2,000-kw. waterwheel generator installation. A Pennsylvania manufacturer has secured a contract for a 12,500-kva. turbo-generator from a Missouri central-station company. Cement mills, chemical plants, iron and steel mills, and automobile interests are coming into the market for heavy equipment of this kind.

Substation account is trending to decidedly higher levels. One maker reports business as being quite brisk, while another manufacturer says that current orders are very encouraging. Transformers are in good demand. A metropolitan central-station has placed a commitment for a 10,000-kw. bank of units to cost $50,000. A producer of switching equipment reports business as fair, but inclined to be a little spotty. Switchboard account shows betterment, with a greater volume of inquiries than for some weeks past. A steam railroad has purchased switchboard and instruments for a substation in the Bronx to cost $125,000.

Motor business is holding up well. Textile mills in the south are placing sizable commitments, while northern metal-working plants, and iron and steel mills also are active in the market. A manufacturer of electric cranes reports trade as improving, with inquiries on the increase. A Wisconsin manufacturer has secured an order for an electric traveling crane from a chemical manufacturer at Baltimore. Industrial control apparatus is showing an improved tone, with inquiries indicating good business in the early future.

Current construction operations in the Eastern district include the following:

The Westchester Lighting Company, Mount Vernon, N. Y., will make extensions in several substations, and carry out line additions, to cost $2,000,000. The Columbia Metal Box Company, New York, plans an addition to cost $100,000. The Bureau of Supplies and Account, Navy Department, Washington, D. C., will receive bids until Sept. 18, for 3 magnetic type tachometers for Diesel engines for the Brooklyn navy yard (Schedule 9673). The Emergency Hospital, Buffalo, N. Y., plans an addition to its power plant to cost $100,000. The Viking Metallic Products Corporation, Jamestown, N. Y., plans an addition, to cost $75,000. The Quisenberry Feed Manufacturing Company, Kansas City, Mo., plans a mill and elevator at Buffalo, N. Y., to cost $125,000. Bound Brook, N. J., plans an ornamental lighting system. Gloucester, N. J., plans an electric lighting system for traffic. The Wright Aeronautical Corporation, Paterson, N. J., plans an addition to cost $150,000.

The Philadelphia & Reading Coal & Iron Company, Philadelphia, plans seven coal breakers and the installation of mining machinery at properties in the Mount Carmel section, to cost $350,000. The Department of Property and Supplies, Harrisburg, Pa., will receive bids until Sept. 25, for electrical supplies (Schedule N). The Columbia Malleable Castings Company, Columbia, Pa., will build an addition to cost $100,000. The Philadelphia & Reading Railroad, Philadelphia, is asking bids until Sept. 24, for a commercial and operating building, with garage and mechanical department, to cost $3.000,000. New Castle, Del., plans an ornamental lighting system, and extensions in distributing system. The Summers Fertilizer Company, Baltimore, Md., plans an addition to its mill in the Canton section to cost $150,000. The General Purchasing Officer, Panama Canal, Washington, D. C., will receive bids until Oct. 2 for insulated lead sheathed copper cable, electric soldering irons, and other electrical and mechanical equipment (Panama Schedule 1901.)

Business in Middle West Shows Improvement

General business continues to show improvement in the Middle West. Industrial activity is increasing; the steel and automotive industries continue to show improvement and employment is somewhat better. Interesting orders placed by utility companies include three 2,000-kva. 12,000-volt transformers, two Vorticose dust collectors complete with appurtenances, two reheater drain pumps complete with appurtenances and several construction orders aggregating $60,000. Jobbers' sales are, for the most part, on the increase. Construction projects are as follows:

The General Motors Institute of Technology, Flint, Mich., will build an addition to cost $100,000. The Bennett Pump Corporation, Muskegon Heights, Mich., plans an addition to cost $75,000. The Newaygo Portland Cement Company, Newaygo, Mich., plans a mill at Charlevoix, Mich., to cost $1,000,000. The Chevrolet Motor Company, Saginaw, Mich., plans a substation to cost $90,000. The Central Steel & Wire Company, Chicago, plans a plant unit to cost $200,000. The Okaw Stove & Enameling Company, New Athens, Ill., plans a plant to cost $85,000. The Baker Manufacturing Company, Springfield, Ill., plans an addition to its road machinery plant to cost $75,000. The Swartwout Company, Cleveland, plans an addition to its steam specialty manufacturing plant to cost $125,000. Aitkin, Minn., plans an addition to its municipal power plant. The Northern States Power Company, St. Paul, Minn., will make additions in its High Bridge power plant. The Cudahy Packing Company, Chicago, plans a refrigerating plant at Sioux City, Iowa, to cost $200,000.

Many Equipment Orders Placed on Pacific Coast

The double week-end holiday perceptibly influenced business and held up the actual placing of several sizable orders. Power company business included four General Electric automatic station regulators valued at $8,000, two carloads of 35-ft. poles for Petaluma and 4,000 assorted copper lugs for Fresno, Calif. Interesting prospective orders include miscellaneous electrical supplies for the Panama Canal, and about $5,000 worth of assorted wiring material for the government hospital at Palo Alto, a steel plant to cost $600,000 for south San Francisco, the electrical layout for nine new schools in the Los Angeles district, a new $500,000 barrack system for Fort Lewis, Washington and $750,000 to $1,000,000 apartment houses for Oakland, San Francisco and Los Angeles. Miscellaneous orders included a $10,529 award for 65 street lighting standards for Stockton, 43 single standards for San Leandro, $2,000 worth of supplies including 2,500 ft. of telephone cable for a sugar refinery, 125,000 ft. of single braid solid rubber covered wire and an assorted lot of 4/0 and 250,000 circular mils feeders for a country club and 150 40-ft. poles for an irrigation district. San Francisco contractors are figuring on a new medico-dental skyscraper requiring 8½ carloads of conduit, one carload of rubber covered wire and 10,000 assorted boxes and covers. Another interesting prospect for a large electrical installation is the purchase of 400,000,000 ft. of timber land in the Alturas district for $3,000,000 by a lumber company.

The Fir Tex Insulating Board Company is planning a $2,000,000 plant in St. Helens, Oregon, and has issued specifications to electrical jobbers in Seattle and Portland for approximately 4,000 hp. in motors.

Seattle is taking bids for lighting and power bonds in the sum of $1,500,000 to cover system extensions and for the Diablo dam construction. The city of Tacoma has opened bids for two 1,950-kva. and two 1,650-kva. self-cooled transformers costing $21,000. The city of Seattle is taking bids for 125,000 lb. of weatherproof copper wire and 5,800 ft. of lead covered underground cable. The motor business was good, orders being about equally divided between mills and allied industrials and dealers. Construction projects are as follows:

The Chrysler Corporation, Detroit, plans an automobile assembling plant at Oakland, Calif., to cost $4,000,000. The Little Rock Power & Water Company, Los Angeles, has secured permission for a hydro-electric power project on Rock Creek, Los Angeles County, to cost $550,000. Los Angeles, Monrovia, Torrance, Santa Cruz, and Riverside, Calif., plan ornamental lighting systems. The Marchetti Motor Patents, Inc., San Francisco, plans an aircraft manufacturing plant to cost $250,000. The Seiberling Rubber Company, Akron, Ohio, plans a factory branch and distributing plant at San Francisco, to cost $100,000.

The Southern California Edison Company, Los Angeles, will make extensions in its No. 1 and 2 Kaweah hydro-electric power plants, near Tulare, Calif., to cost $160,000. The Inland Empire Paper Company, Spokane, Wash., has approved an expansion program at its mill at Millwood, to cost $250,000. The Mountain States Power Company, Tacoma, Wash., will build a transmission line from Lovell, Wyo., to Greybull Basin, Wyo., and vicinity, to cost $140,000. The Montana Power Company, Great Falls, Mont., plans extensions in the transmission line from Holter dam to Wolf Creek, Mont., and vicinity. The Empire Zinc Company, Gilman, Colo., plans a flotation mill, with electric operated machinery, and has contracted with the Public Service Company of Colorado for power service, which will build a 90,000-volt transmission line to the mill site. The Arizona Edison Company, Douglas, Ariz., plans a power dam for hydro-electric power development on the Gila River, near Douglas. The Huma Utilities Company, Huma, Ariz., plans a power substation on local site, and one at Somerton, Ariz.

Business in St. Louis Shows Little Change

Conditions in the St. Louis district have not changed perceptibly. Manufacturers report only a fair demand for apparatus of stock sizes. The reported activity in the oil fields has materialized in an order for a lot of pumping and drilling motors aggregating $8,000. Contracts for a street lighting job costing $6,000 and four small switch boards to cost $12,000 were booked with power companies in the Southwest. An electric locomotive for an Illinois coal company costing $7,500, a switchboard for $3,000 and a 375-kw. generator to cost $3,000 were the only other orders of contract size reported. Construction projects are as follows:

The United States Cold Storage Company, Kansas City, Mo., plans a refrigerating plant to cost $500,000. Kirksville, Mo., will build a municipal electric light and power plant to cost $200,000. Stanberry, Mo., is asking bids until Sept. 25, for a municipal electric power plant and system. The N. O. Nelson Manufacturing Company, St. Louis, manufacturer of plumbing equipment and supplies will build an addition to cost $200,000. The Fort Smith Light & Traction Company, Fort Smith, Ark., will build a transmission line from Fort Smith to Ozark, Ark., to cost $200,000. Dallas, Galveston, and Lewisville, Tex., plan ornamental lighting systems. The Texas Corporation, Houston, Tex., plans an oil refinery in the southwestern part of the state, to cost $750,000. The Texas Electric Steel Castings Company, Houston, Tex., plans an addition. The Standard Rock Asphalt Company, San Antonio, Tex., plans a plant in Uvalde and Kinney Counties, to cost $100,000. The Baton Rouge Electric Company, Baton Rouge, La., plans a transmission line from Baton Rouge to Lafayette and vicinity, to cost $500,000.

Activities of the Trade

Naval Officers Report for Duty at Westinghouse Plant

Fifteen of the 41 officers of the United States Navy who are students pursuing graduate courses in the School of Mines, Engineering and Chemistry of Columbia University during the summer session have reported for duty at the South Philadelphia works of the Westinghouse Electric & Manufacturing Company to hear a series of lectures given by Westinghouse engineers on turbine design, blading, electric drive and other subjects pertaining to marine engineering. All are graduates of the Naval Academy and have had more than six years of active service. They will return to Columbia at the opening of the next winter session for a full year's training in mechanical and electrical engineering. At commencement in 1929 the students will receive the degree of master of science, after which they will be assigned to various manufacturing organizations, among which is the Westinghouse Electric & Manufacturing Company.

THE IDEAL COMMUTATOR DRESSER COMPANY, Sycamore, Ill., announces the appointment of the Industrial Supply Company, 121 Motor Avenue, Salt Lake City, Utah, as its sales representative for the sale of Ideal commutator resurfacers and motor maintenance equipment in the Rocky Mountain district. The company also announces that it has placed on the market a portable grinder known as the "Perfect Tool Rest."

Ajax Reports Steady Sales of High-Frequency Furnaces

Steady growth in the use of high-frequency furnaces is reported by the Ajax Electrothermic Corporation, Trenton, N. J. A list of installations of Ajax-Northrup high-frequency induction furnaces made and ordered during 1928 is given in the accompanying table. Some of the furnaces listed were sold by the company's licensees in Europe.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, merchandising division, Mansfield, Ohio, announces a complete new line of full-automatic "Flavor Zone" ranges.

THE CONDIT ELECTRICAL MANUFACTURING CORPORATION, Boston, manufacturer of circuit breakers and power switchboards, announces a new type M-9 manhole oil circuit breaker.

THE GENERAL ELECTRIC COMPANY announces that it is now manufacturing a complete line of devices for attaching service wires to houses, as well as for general industrial purposes. These devices have been divided into three classes, as follows: Wire holders, wire brackets and wire racks.

THE IDEAL COMMUTATOR DRESSER COMPANY, Sycamore, Ill., announces that it has made a 25 per cent reduction in the price of Ideal solderless-tapeless wire connectors and that an improvement also has been made. The company also has placed on the market its "Large Universal" connector for use in connection with larger wires.

International Combustion Engineering Buys Boiler Company

ONE of the most important acquisitions in the history of the International Combustion Engineering Corporation has been announced by G. E. Learnard, president. Negotiations have been completed for the purchase of the Hedges, Walsh, Weidener Company, a recent combination of the Casey-Hedges Company and the Walsh & Weidener Company, two of the oldest and most widely known boiler manufacturing companies in the United States. The new acquisition will function in all phases of its activity through the Combustion Engineering Corporation, the American operating subsidiary of the International Combustion Engineering Corporation.

With this acquisition International Combustion not only augments its present extensive manufacturing facilities with two of the most modern boiler plants in the country but acquires a large and going boiler business, heretofore competitive. This most recent acquisition is in thorough keeping with International Combustion's consistent policy of expansion along sound economic lines by the acquisition of going units of high standing, whose business fits in with the company's policy of covering in a complete manner the fuel-burning and steam-generating field.

Acquiring the Hedges-Walsh-Weidener line makes the company's line of boilers now as complete as its fuel burning equipment and makes possible the offering of any type of large or small boiler now available in the American market, but with the added advantage that it can offer a complete steam-generating plant—from coal bunker to ashpit—built under one authority.

The acquisition of the Walsh-Weidener plant is of particular importance to Combustion Engineering at this time as the plant is the only one in the United States with manufacturing facilities of sufficient size to handle the large steam-generating units upon which the company has been specializing, such as those recently installed by the New York Steam Corporation at its Kip's Bay plant and the New York Edison Company at its 14th Street plant, which latter boilers, delivering 1,000,000 lb. of steam per hour, will be the largest in the world.

A number of other progressive boiler companies have either purchased or are contemplating similar units of almost equal size. Practically all of these extremely large units have been designed

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List of Installations Made and Ordered During 1928 (Ajax Electrothermic Corporation)

	Kw.
American Rolling Mill Company	20
Hoskins Manufacturing Company	150
Heppenstall Forge & Knife Company	150
Allen Everitt Sons, England	100
Henry Wiggins & Company, England, 500-600 lb. steel melting	150
Arthur Balfour Company, England	150
Telegraph Construction and Maintenance Company, Ltd., England, 500-600-lb. steel melting	150
MM. S. A. de Commentry-Fourchambault & Decazeville, France	150
Jacob Holtzer Company, France	150
Compagnie Francaise de Métaux, France	100
Watertown Arsenal	150
General Fire Extinguisher Company	100
Stahlwerk Hoesch, Dortmund, Germany, 1-ton refining	330
Fereinigen-Stahlwerk-Bochumer-Verein, Germany, 1-ton refining	300
Stahlwerke-Becker, Dusseldorf, Germany, 1-ton refining	300
I. G. Farbenindus'rie, Ludwigshafen, Germany	45
Russische Handelsver retung, Germany	45
Metallwerke AG. Dornach, Switzerland	100
Dr. Alexander Wacker, A.G., Werk Techechnitz, Germany	35
Technical High School, Charlottenburg, Germany	16
Eight miscellaneous 6-kw. laboratory furnaces, Germany	...

	Kva.
National Tube Company	35
Western Electric Company	35
U. S. Assay Office	35
American Car & Foundry Company	35
Carnegie Steel Company	35
Yale University	35
Wm. Grant	35
The Duriron Company	35
Rensselaer Polytechnic Institute	35
Robert D. Pike	35
Carnegie Institute of Technology	35
Vanadium Alloys Steel Company	35
Standard Telegraph & Cables, Ltd., England	15
Lehigh University	15
General Electric Company, Schenectady	3
Electric Furnace Company, England	3
University of Illinois	3
Virginia Polytechnic Institute	3
University of Saskatchewan, Canada	3
U. S. Bureau of Mines, Tucson	3
Bureau of Standards, Washington	3

by the Combustion Engineering Corporation, whose original installation at the Ford Motor Company was a forerunner of all the present large units.

The Walsh-Weidener reputation for quality workmanship and precision methods, extremely necessary to this type of specialized work, was the basic reason for the negotiations leading to the purchase. From an economic standpoint, the acquisition is as important as from the mechanical, as the economies made possible through the consolidation of these properties under one management will readily and immediately accrue to Combustion Engineering's owners.

THE ANACONDA COPPER MINING COMPANY, rolling mills department, 111 West Washington Street, Chicago, has appointed Dudley S. Young as its sales engineer. Mr. Young has recently severed his connections with the Electric Bond & Share Company of New York.

THE OKONITE COMPANY, New York, has appointed William J. Day as its sales representative, with headquarters in the Statler Building, Boston. Mr. Day was formerly sales representative of the Pettingell-Andrews Company, Boston (now the General Electric Supply Corporation.)

THE AMERICAN BROWN BOVERI ELECTRIC CORPORATION has received an order from the Pennsylvania Railroad for ten multiple-unit railway motors of the new type. The former company has recently designed a new type motor using 3,000 volts direct current for operation on multiple-unit cars.

THE DOVER MANUFACTURING COMPANY, Dover, Ohio, manufacturer of electric irons and appliances, announces the removal of its New York office from 200 Fifth Avenue to the Graybar Building, 420 Lexington Avenue, with H. E. Mitchell in charge of sales.

THE LELAND ELECTRIC COMPANY, Dayton, Ohio, manufacturer of electric fractional-horsepower motors, has had plans prepared by the Ballinger Company, Philadelphia, architect and engineer, for a one-story addition, 165 ft. x 485 ft.

THE CHANDEYSSON ELECTRIC COMPANY, St. Louis, manufacturer of electric equipment, is planning the construction of another addition to its plant, following the erection of another extension now in progress.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has received an order from the city of Seattle for a 33,000-kva. waterwheel generator for the Gorge plant of that city. The new generator will be rated at 11,000 volts, running at 257 r.p.m.

THE BOTFIELD REFRACTORIES COMPANY, Swanson and Clymer Streets, Philadelphia, manufacturer of "Adamant" fire brick cement, announces the appointment of W. E. Tierney as its representative in the South and Southwest, with headquarters in New Orleans.

New Equipment Available

Oil Circuit Breaker for Industrial Use

The new type F-10 oil circuit breaker applicable to 750 and 2,500-volt circuits and having a current carrying capacity of 200 and 300 amp. is announced by the Westinghouse Electric & Manufacturing Company. This breaker is furnished in two, three and four-pole combinations and is either automatic or non-automatic as desired. The automatic breaker has an interrupting capacity of 5,000 amp. on the 200-amp. breaker and 7,500 amp. on the 300-amp. breaker at rated voltage.

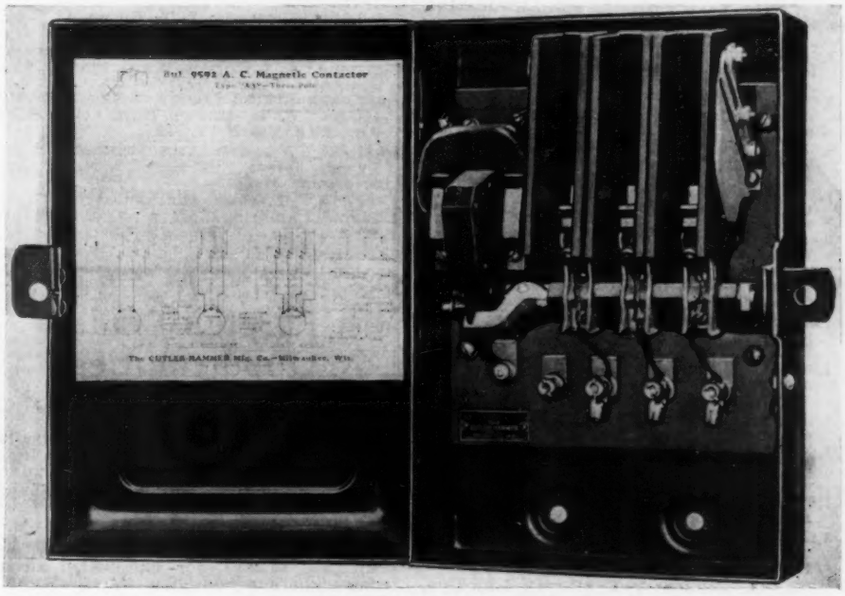
The frame, which has openings for taking leads down the two sides of the breaker or out through conduit knockouts on the sides or back of the breaker, is constructed of heavy cast iron and arrangements are made for indoor mounting on either wall, frame or structure. The terminal board of the new breaker is made of "Moldarta," which is molded true to form, insuring perfect alignment of all terminals and contacts. In addition, the "Moldarta" extends a considerable distance up around the terminal studs of the breaker, thus giving extremely long creepage paths between live parts. The trip coils of this breaker are conveniently located so that calibration adjustments are made easily. The breaker opens by gravity assisted by tension springs and is equipped with bumpers to absorb the shock of opening. The open position is maintained by gravity. There is ample air space at the top of the tank to allow for gas expansion.

GROUNDING DEVICE.—A grounding device which consists of a heavy copper terminal lug incased in a malleable iron body which screws on the run of conduit containing the ground wire, just as a coupling would, has been placed on the market by the merchandise department of the General Electric Company. The bolt to which the terminal lug is fastened extends through the bottom of the body and is anchored to a pair or heavy grooved jaws which grip the water pipe, thus assuring a perfect ground. The jaws may be pivoted through an angle of 360 deg. by means of a set of reciprocal teeth on the body and jaws.

A.-C. Magnetic Contactors

A complete new line of alternating-current magnetic contactors, designed especially for controlling lighting and power circuits automatically, and for miscellaneous applications, is announced by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. High efficiency hammer head type magnets with self-aligning armature, continuous duty magnet coil, hardened steel bushings, tin dipped solid copper contacts, magnetic blowouts and chimney type arc shields are some of the features. The large size contactors have the magnet frame supported on a spring plate which absorbs the shock of the magnet on closing.

Two- or three-wire control can be used. With two-wire control low voltage release is provided and with three-wire control low voltage protection is provided. A wide variety of types and sizes are available. There are two, three and four pole types with a capacity ranging from 20 to 150 amp. The contactors are supplied mounted in a split inclosing case or on a slate panel for switchboard mounting.



Three-pole, 40-amp. alternating-current contactor

Electrical Patents

Announced by U. S. Patent Office

(Issued Aug. 21, 1928)

1,681,792. LIGHT SIGNAL; C. S. Snavely, Pittsburgh, Pa. App. filed March 8, 1923.

1,681,795. ELECTRICAL DISPLAY APPARATUS; P. H. Waller, London, England. App. filed Sept. 8, 1927.

1,681,847. FUSE PLUG; W. H. Fabrey, Schenectady, N. Y. App. filed Nov. 4, 1927.

1,681,851. RESETTABLE RELAY; B. E. Getchell, Plainville, Conn. App. filed Dec. 3, 1927.

1,681,884. ELECTRICAL CONDENSER; W. H. Goodman, Kensington, London, England. App. filed Feb. 12, 1923.

1,681,904. WELDING ROD; P. P. Pipes, Mansfield, Ohio. App. filed March 18, 1927.

1,681,908. ELECTRIC CONNECTING PLUG; J. G. Peterson, Hartford, Conn. App. filed April 7, 1924.

1,681,915 and 1,681,916. DYNAMO-ELECTRIC-MACHINE STATOR; J. M. Barr, Milwaukee, Wis. Apps. Dec. 12, 1923, and Feb. 18, 1924.

(Issued Aug. 28, 1928)

1,681,924. ELECTRIC REGULATION; J. L. Creveling, Oracle, Ariz. App. filed April 22, 1924.

1,681,951. HEATING UNIT FOR ELECTRICALLY-HEATED UTENSILS; E. S. Preston, Chicago, Ill. App. filed Jan. 23, 1928.

1,681,956. PROCESS OF MAKING ELECTRICAL HEATERS; R. L. Shriner, Weehawken, N. J. App. filed March 6, 1926.

1,681,963. MAGNETOPHONE; R. L. Williams, Newton, Mass. App. filed Jan. 2, 1920.

1,681,982. DIRECTIVE SOUND TRANSMISSION; H. C. Hayes, Anacostia, D. C. App. filed June 25, 1919.

1,682,007. SWITCH; E. H. Freeman, Trenton, N. J. App. filed July 10, 1926.

1,682,086. MAGNETO-ELECTRIC MACHINE; G. Modigliani, Ivrea, Italy. App. filed June 1, 1927.

1,682,105. INSULATOR FITTING; A. O. Austin, Barberton, Ohio. App. filed March 1, 1923.

1,682,109. RAIL BOUNDING; W. P. Bovard, Mansfield, Ohio. App. filed Oct. 31, 1923.

1,682,113. RHEOSTAT; H. D. Brown, Los Angeles, Calif. App. filed April 8, 1926.

1,682,136. TROLLEY FROG; S. S. Matthes, Mansfield, Ohio. App. filed Oct. 12, 1927.

1,682,211. SWITCH; J. W. Bishop, Muskegon, Mich. App. filed April 4, 1923.

1,682,213. WINDING AND DEREELING DEVICE; P. E. Chapman, St. Louis, Mo. App. filed Nov. 4, 1926.

1,682,220. IGNITION DEVICE; H. Ford, Dearborn, Mich. App. filed Oct. 14, 1926.

1,682,221. TERMINAL-POST CONNECTOR; W. E. Gossling, New York, N. Y. App. filed July 30, 1920.

1,682,257. SAFETY DEVICE FOR LUBRICATING SYSTEMS; E. H. Strong, Pearsall, Texas. App. filed Feb. 18, 1927.

1,682,288. LIGHTNING-ROD CONSTRUCTION; S. D. Kretzer, St. Louis, Mo. App. filed Sept. 22, 1921.

1,682,335. ATTACHMENT PLUG; W. F. Hendry, Ossining, N. Y. App. filed April 6, 1925.

1,682,337. AUTOMATIC COOKING; F. W. Hewitt, Arlington, Mass. App. filed Nov. 8, 1927.

1,682,364. MAGNETIC CORE MATERIAL; S. Ballantine and R. W. Seabury, Boonton, N. J. App. filed Jan. 9, 1923.

1,682,365. FUSE CUT-OUT; J. B. Bourgeois, Worcester, Mass. App. filed May 6, 1926.

1,682,380. STARTING SYSTEM FOR ELECTRIC MOTORS; H. King, Pittsburgh, Pa. App. filed July 19, 1920.

1,682,381. MOTOR-CONTROL SYSTEM; R. T. Knitzing, Wilkinsburg, Pa. App. filed Nov. 21, 1925.

1,682,383. ELECTRICAL RECTIFYING APPARATUS; J. Kübler, Baden, Switzerland. App. filed March 20, 1926.

1,682,384. COOKING DEVICE; J. G. Lambert, Chicago, Ill. App. filed Feb. 1, 1928.

1,682,388. INDUCTION FURNACE; R. B. Lincoln, Wilkinsburg, Pa. App. filed March 21, 1927.

1,682,401. THERMAL RELAY; A. J. Mottlau, Pittsburgh, Pa. App. filed Dec. 8, 1925.

1,682,402. HEATING-ELEMENT SUPPORT; H. A. Mulvany, Berkeley, Calif. App. filed Dec. 22, 1926.

1,682,403. BARREL; T. E. Murray, Brooklyn, N. Y. App. filed Nov. 22, 1920.

1,682,413. SYSTEM OF CONTROL; F. M. Parks, Murraysville, and G. R. Shaw, Wilkinsburg, Pa. App. filed Sept. 26, 1925.

1,682,424. CENTRIFUGAL STARTER FOR ELECTRIC MOTORS; M. Schiesser, Baden, Switzerland. App. filed Jan. 13, 1925.

1,682,426. APPARATUS FOR PRODUCING SHEETS AND SIMILAR ARTICLES ELECTROLYTICALLY; J. C. F. A. Schütte, Altdorf, Switzerland. App. filed Oct. 6, 1927.

1,682,428. MERCURY-VAPOR RECTIFIER; O. Seitz, Baden, Switzerland. App. filed Sept. 10, 1925.

1,682,429. CIRCUIT-CONTROLLING MEANS; A. G. Shaver, Chicago, Ill. App. filed April 23, 1923.

1,682,430. MOTOR WINDING FOR ASYNCHRONOUS MOTORS WITHOUT STARTERS; C. Shenfer, Moscow, Russia. App. filed Jan. 2, 1923.

1,682,432. CONTROL APPARATUS; W. H. Smith, Wilkinsburg, Pa. App. filed Sept. 16, 1926.

1,682,435. MAGNETIC ANALYSIS OF DRILLS; T. Spooner, Edgewood Park, Pa. App. filed Oct. 25, 1921.

1,682,448. CONTROL SYSTEM; V. G. Vaughan, Mansfield, Ohio. App. filed June 16, 1926.

1,682,451. TYPEWRITER-KEY PUNCH; A. Weiland, Neshanic, N. J., H. R. Russell, Douglaston, N. Y., and C. A. Mezger, New Brunswick, N. J. App. filed Nov. 13, 1924.

1,682,452. AUTOMATIC SUBSTATION; R. J. Wensley, Edgewood, Pa. App. filed Sept. 23, 1924.

1,682,457. METHOD OF MAKING RESISTANCE DEVICES; V. K. Zworykin, Swissvale, Pa. App. filed Sept. 2, 1926.

1,682,461. FREQUENCY REGULATOR; G. Y. Allen, East Orange, N. J. App. filed Nov. 5, 1923.

1,682,466. CONTROL APPARATUS; B. O. Austin, East Pittsburgh, Pa. App. filed June 23, 1925.

1,682,467. ELECTRIC IRON; C. B. Backer, Brooklyn, N. Y. App. filed June 16, 1926.

1,682,476. LIGHTNING ARRESTER; E. W. Breisch, Edgewood, and F. B. Falknor, Wilkinsburg, Pa. App. filed April 18, 1922.

1,682,508. MOTOR-CONTROL SYSTEM; A. L. Harvey, Wilkinsburg, Pa. App. filed Sept. 12, 1922.

1,682,510. RELAY; C. G. Harwig, Chicago, Ill. App. filed Nov. 16, 1922.

1,682,523. ELECTRODE HOLDER; A. C. James, Houston, Texas. App. filed May 21, 1927.

1,682,525. COMMUTATOR DISTRIBUTOR FOR INTERNAL-COMBUSTION ENGINES; R. H. Josephson, Parramatta, near Sydney, New South Wales, Australia. App. filed Dec. 15, 1925.

1,682,541. ELECTRIC-CONTROLLER CONSTRUCTION; J. F. Schnabel, Cleveland, Ohio. App. filed April 7, 1927.

1,682,547. ELECTRICITY METER; W. Beusch, Zug, Switzerland. App. filed Aug. 6, 1923.

1,682,549. ELECTRIC-CIRCUIT CONTROLLER; H. E. Billerbeck, Glenside, Pa. App. filed July 15, 1927.

1,682,566. METHOD OF AND APPARATUS FOR CONTROL OF ELECTRICAL CONDITIONS OF CIRCUITS; R. B. Hunter and C. T. Evans, Milwaukee, Wis. App. filed Jan. 17, 1924.

1,682,599. SWITCH SOCKET; G. M. Condit, Waterville, Conn. App. filed May 18, 1926.

1,682,661. LIGHTER; J. T. Burns, Philadelphia, Pa. App. filed Aug. 23, 1927.

1,682,676. ELECTROMAGNETICALLY-OPERATED DEVICE; A. J. Horton, White Plains, N. Y. App. filed June 22, 1918.

1,682,682. SPRING LOCK FOR INCANDESCENT LAMPS; F. H. Owens, New York, N. Y. App. filed March 17, 1926.

1,682,683. TOASTER AND BROILER; A. C. Parodi, Jersey City Heights, N. J. App. filed June 27, 1925.

1,682,712. ELECTRIC COMPENSATOR; G. W. Pierce, Cambridge, Mass. App. filed June 25, 1919.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Zurich, Switzerland (No. 33,239), for illuminated advertising signs and household electrical appliances.

An agency is desired in Cairo, Egypt (No. 33,179), for automobile batteries.

A sole agency is desired in Melbourne, Australia (No. 33,205), for battery testers.

An agency is desired in Berlin, Germany (No. 33,206), for electrical heating and cooking equipment.

Purchase or agency is desired in Lourenco Marques, Portuguese East Africa (No. 33,204), for household electrical appliances, such as heaters, fans, kettles, blowers and irons.

An agency is desired in Winnipeg, Canada (No. 33,180), for power-house equipment.

Purchase is desired in Cairo, Egypt (No. 33,203), of ornamental street-lighting fixtures.

Purchase is desired in Copenhagen, Denmark (No. 33,177), of electric vacuum cleaners.

New Trade Literature

TRANSFORMERS.—The Packard Electric Company, Warren, Ohio, is distributing pamphlets Nos. 529 and 530, describing and illustrating its type LD dry-type current transformers and its types PS and PD indoor dry-type potential transformers.

POLES. — "The Autobiography of a 'Black Beauty' Pole" is the title of a booklet issued by the Texas Creosoting Company, Orange, Tex., which contains a tale of a tree that made a name for itself.

AIRPORT ILLUMINATION. — "Airport Illumination" is the subject of bulletin GEA-982, issued by the General Electric Company, Schenectady, N. Y. Views of lighted airports are shown, and a description of the various equipment is given. There also is a table of "Mazda" lamps for the different beacons and lights, with dimensions and hours of life.

MOTORS.—Bulletin No. 507 issued by the Louis Allis Company, Milwaukee, describes and illustrates its direct-current motors. The bulletin covers the construction features of the motors as well as a number of illustrated applications.

OSCILLOGRAPHS. — The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a publication entitled "Oscillography," which discloses the remarkable progress made during the past decade in the design and application of the oscillograph. In this publication the various types of apparatus are discussed in a non-technical manner. It also contains illustrations of oscillographs set up for operation and schematic diagrams.

MOTORS.—The Reliance Electric & Engineering Company, Ivanhoe Road, Cleveland, has issued bulletin No. 1093, which covers the type AL Reliance across-the-line motors with ball bearings. The bulletin is well illustrated and contains questions and answers about across-the-line motors.

CRAWLER CRANE.—The "Built for Service" crawler crane book No. 995 issued by the Link-Belt Company, Chicago, covers the company's complete line of gasoline, Diesel and electric crawler cranes. The book is well illustrated and shows the use of the various attachments. Data on lifting capacities, approximate operating speeds, line pull, tractive effort, etc., are given and supplemented by line drawings which show dimensions for operating limits.

SWITCHES, MOTORS, ETC.—The General Electric Company, Schenectady, N. Y., is distributing the following bulletins: GEA-19E, describing its CR7006-D4 and D5 alternating - current enclosed magnetic switches; GEA-1028, describing its form J, class BU totally inclosed motors; GEA-723, covering its coal and ore-bridge equipment for alternating-current operation; GEA-781A, covering its steam-engine-driven generating sets for marine service; GEA-874B, describing its belt, motor or gas-engine drive, stationary or portable, self-excited, variable-voltage, single-operator type WD-200A arc welder, and GEA-937A, containing price lists of laminated and plastic molded "Textolite" products.

CRANES, POWER SHOVELS, ETC.—The Harnischfeger Corporation, Milwaukee, has issued a bulletin entitled "What P. & H. Users Say." The bulletin contains a collection of sample testimonial letters written by users of P. & H. equipment. It also contains photographs of P. & H. equipment in actual service.

CONDENSER-TYPE BUSHINGS.—Publication L. 3568-C of the Westinghouse Electric & Manufacturing Company describes its condenser type insulating bushing which is now being used on the outlet leads of Westinghouse high voltage transformers and circuit breakers.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Not Too Early to Think of Christmas

HEAVY December sales are always expected by dealers in commodities that may be designated as luxuries or semi-luxuries. Even the necessities are bought more liberally as the holiday season approaches, for what is regarded as indispensable by one family is a luxury for another in less prosperous circumstances.

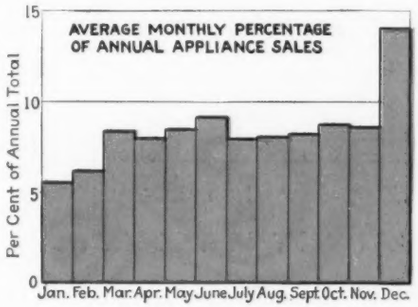
In the electric industry, as concerns the sale only of energy, the swing of the seasons dominates the residential load curve. In the high latitudes, particularly in far northern Europe, where twilight merges into dawn in midsummer, the variation between the June and December demands is striking. Even in the zone occupied by the United States the gain in energy output appears on the chart as a series of upward-trending festoons.

These things are due to nature's cycle. But man, by his holidays having their roots deep in human response to nature's moods, has accentuated or modified them in ways that greatly influence social and business activities. We are so accustomed to this ebb and flow that we take it entirely for granted; our chief concern, in a business sense, is to measure its magnitude so that we may adequately prepare for it, year after year. This we can do only in the light of experience, either our own or that of others.

To the electrical industry these fluctuations are of significance in connection with appliance sales. How they affected the monthly business, in this field, of one large power company is indicated on the accompanying charts. The annual average per residential customer, about $5.10 in 1925 and $5.40 in 1926, obviously reflects only a fraction of such purchases by the communities served, since the sales by other agencies are not taken into account. What does stand out conspicuously is the predominance of December sales, constituting 12.8 per cent of the total in one year and 15.2 per cent the next, the average being 14 per cent. Evidently the experience of this company (Company "A") closely resembles that reported by another (Company "B"), as is shown in parallel columns in the accompanying table.

There are minor differences but the December peak stands out in both, preceded by moderate activity in fall and followed by weakness in the new year, when the family purse is recovering from its holiday exhaustion.

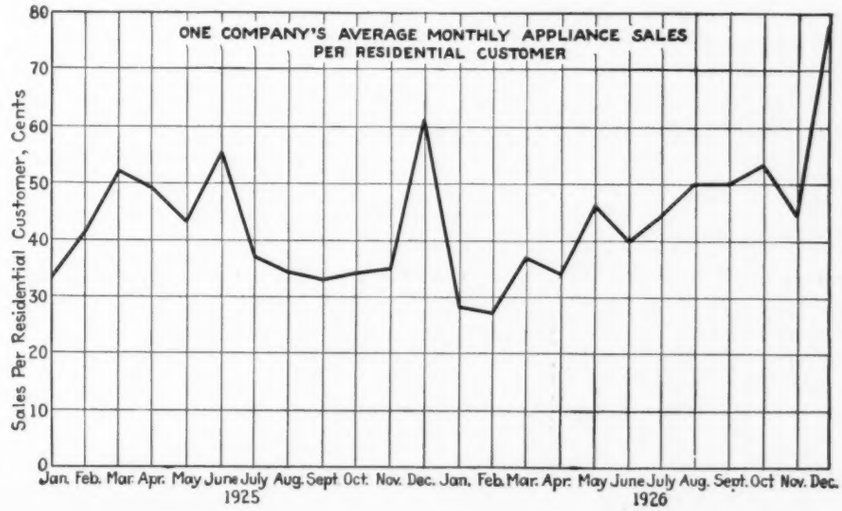
Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers to quote or use them for any legitimate purpose. While no acknowledgment is required, users will, by crediting the ELECTRICAL WORLD, help it in obtaining and compiling further basic information.


AVERAGE MONTHLY PERCENTAGE OF ANNUAL APPLIANCE SALES
Per Cent of Annual Total
15
10
5
0
Jan. Feb. Mar. Apr. May June July Aug. Sept Oct. Nov. Dec.

Appliance sales reach their peak in December

MONTHLY SALES OF ELECTRICAL APPLIANCES

Month	Per Cent of Annual Total Company A	Company B
January	5.6	7
February	6.2	7
March	8.3	8
April	7.8	8
May	8.4	8
June	9.1	8
July	7.9	7
August	8.0	6
September	8.1	8
October	8.6	9
November	8.0	10
December	14.0	14



New England Industry on the Upward Trend

REPORTS received by the ELECTRICAL WORLD on the consumption of electrical energy by 400 large manufacturing plants in various industries and scattered throughout the New England States indicates that the low point of industrial operations for the summer, and probably for the current year, was reached in July. Operating data for past years would indicate that the upward turn witnessed during August was normal in nature, and that in all probability each succeeding month during the remainder of the year will witness an increased rate of productive activity.

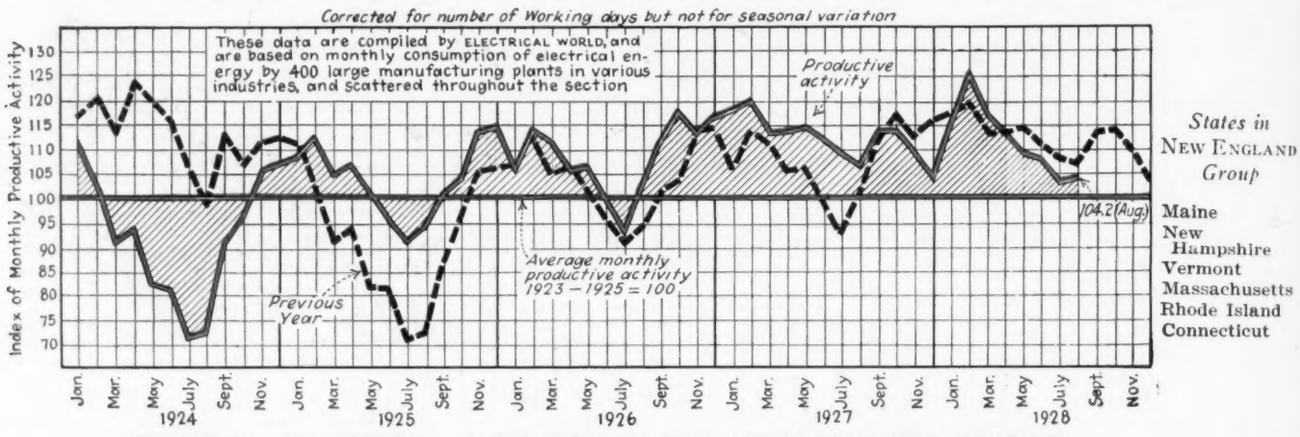
August operations were at a rate of about 1.7 per cent over July, but were about 1.2 per cent under August of last year. New England industry as a whole has been operating under the same month in 1927 ever since last March, due very largely to the comparatively low rate of operations being witnessed in the textiles industry. An indication of the very favorable results of the increased diversification of New England industry since the war is to be found in the fact that while the textiles industry is operating on a plane 23 per cent under 1927, and the leather industry is 30 per cent under last year, yet the metal industries are reporting a rate of operations 21 per cent over 1927 and the rubber products industry 28 per cent above last year. When the various industrial groups are weighted in accordance with their importance in New England's industrial structure, it is found that, as indicated above, general industry is operated on a plane only slightly below that of last year.

Indexes of Productive Activity in the New England States

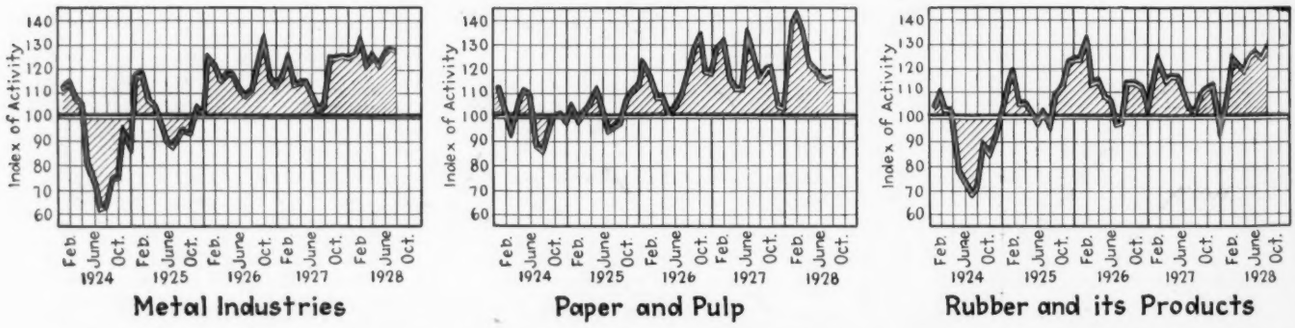
All Figures Adjusted for Number of Working Days

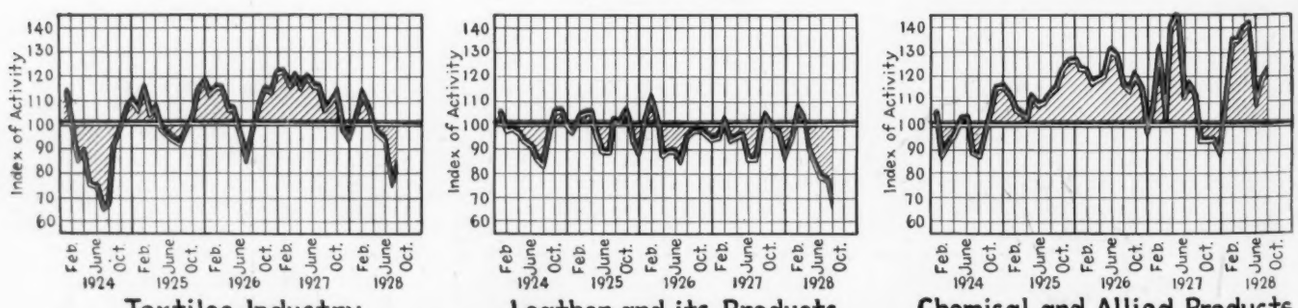
	August, 1928	July, 1928	August, 1927	Average for First Eight Months, 1928	Average for First Eight Months, 1927
All industry	104.2	102.4	105.4	111.6	113.3
Chemical and allied products	122.0	119.2	111.2	125.4	123.1
Leather and its products	68.7	78.8	98.5	88.4	93.8
Lumber and its products	100.4	94.8	107.0	105.1	.....
Metal industries group	128.8	129.6	106.5	126.6	113.2
Paper and pulp	116.2	115.2	115.2	125.9	121.4
Rubber and its products	130.0	125.4	101.3	122.6	112.3
Textiles	81.8	74.8	106.4	96.3	116.4

ELECTRICAL WORLD *Barometer of Industrial Activity in the New England States*


Corrected for number of Working days but not for seasonal variation
These data are compiled by ELECTRICAL WORLD, and are based on monthly consumption of electrical energy by 400 large manufacturing plants in various industries, and scattered throughout the section
Productive activity
Previous Year
Average monthly productive activity 1923 – 1925 = 100
104.2 (Aug.)
Index of Monthly Productive Activity
States in NEW ENGLAND Group
Maine
New Hampshire
Vermont
Massachusetts
Rhode Island
Connecticut
1924
1925
1926
1927
1928

GENERAL INDUSTRIAL ACTIVITY IN THE NEW ENGLAND STATES





PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE NEW ENGLAND STATES